URRBI 1

Report GK-36174/P3K0316

UTILIZATION OF RESEARCH RESULTS IN THE BUILDING INDUSTRY

A state of the art survey

Duncan M. Wilson
Boston Architectural Center
320 Newbury Street
Boston, Massachusetts 02115

June 1974

Final report for Period October 1972-June 1974

Prepared for
National Science Foundation
Washington, D.C. 20550

Boston Architectural College
Library

Boston Architectural College
Library

© Boston Architectural Center, June 1974
Library of Congress Card Catalogue Number 66-30308

Opinions and interpretations expressed in Part I are those of the author and are not necessarily those of the performing organization (Boston Architectural Center) or the sponsoring agency (National Science Foundation).

Descriptions of research and information disseminating organizations in Part III are taken, as much as possible, directly from brochures and pamphlets provided by the organizations.

"...there is no dependable system for informing all decision-makers in (the building) industry that a proposed innovation is technically valid. In fact, innovators have no reliable system to inform each other about current technical advances in the state of the art."[1]

---

1. Pellish, David M., "A Philosophy for Industrialization", in Dietz, Albert G.H. and Laurence S. Cutler, Industrialized Building Systems for Housing, p. 143.

TABLE OF CONTENTS

Preface..... v

Abbreviations.....vi

PART I: NARRATIVE

Introduction..... 1

Findings..... 11

Conclusions..... 34

Recommendations..... 35

PART II

A. Comments and Observations about Research in the Building Industry..... 37

B. Selected Responses to the Comments and Observations..... 41

PART III: Descriptions of Selected Research Sponsoring, Conducting and Disseminating Organizations

A. U.S. Government..... 71
B. Quasi-Government..... 96
C. Canadian Government.....103
D. University.....108
E. Professional.....114

APPENDICES

I. Organizations visited and contacts; Conferences attended.....128

II. Additional organizations in original sample who were not visited, with reasons for including them in the study...146

REFERENCES.....157

BIBLIOGRAPHY.....158

PREFACE

The endeavor of this investigator is to provoke thought, discussion and debate, and even controversy over some statements in order to hopefully lead to positive action for mutual advancement and benefit in the area of research in building. The report will be viewed differently depending upon the occupation, position, background, attitude and philosophy of the reader.

Directories of on-going and completed research, researching organizations and funding agencies exist for those who take the time to look for them. Rather than rewrite what is already in print, the attempt is made to outline problems that universities, government agencies, industries and private/professional organizations meet and how they cope with these problems in their funding, conducting and disseminating of results of building research.* The ensuing discussions are derived primarily from face-to-face meetings, now written reports.**

---

* Part III provides descriptions and locations of several such organizations.

** A reference list and bibliography are provided at the end of the report.

LIST OF ABBREVIATIONS

ACSA	Association of Collegiate Schools of Architecture
AFL-CIO	American Federation of Labor - Congress of Industrial Organizations
AIA	American Institute of Architects
ASIS	American Society for Information Service
AR/9	9th Annual Research Conference of AIA
BAC	Boston Architectural Center
BCED	Bibliography of the Computer in Environmental Design
BEAM	Building Equipment Accessories and Materials
BRICS	Building Research Information Correlation Service
BSIC/EFL	Building Systems Information Clearinghouse / Educational Facilities Laboratories
Calfornet	California Forest Research Information Network
CAMESA	Canadian Military Electronics Standards Agency
CBT	Center for Building Technology
CCIS	Canadian Construction Information System
CEM	Clearinghouse on Educational Management
CER	Center for Environmental Research
CERL	Construction Engineering Research Laboratory
CIB	International Council for Building Research Studies and Documentation
CLIS	Clearinghouse on Library and Information Sciences
CPED	Computer Programs in Environmental Design
CPL	Council of Planning Librarians
CRIQ	Centre Recherche Industrielle Quebec
CRUSK	Center for Research on the Utilization of Scientific Knowledge
D	Development
DATRIX	Direct Access to Reference Information: a Xerox service
DBR	Division of Building Research
DHEW (HEW)	U.S. Department of Health Education and Welfare
DOD	Department of Defense
E	Evaluation
EFL	Educational Facilities Laboratories, Inc.
Ei	Engineering Index, Inc.
EIS	Engineering Information Service
ERIC	Educational Resources Information Center
ESL	Engineering Societies Library
FS (USDAFS)	U.S. Department of Agriculture Forest Service

FPRS	Forest Products Research Society
GIDEP	Government-Industry Data Exchange Program
GRA	Government Reports Announcements
GRI	Government Reports Index
GRTA	Government Reports Topical Announcements
HEW (USDHEW)	U.S. Department of Health Education and Welfare
HRIS	Highway Research Information Service
HUD (USDHUD)	U.S. Department of Housing and Urban Development
I/A	Implementation/Application
IBEC (INBEX)	Industrialized Building Exposition and Congress
IDEP	Interservice Data Exchange Program
INBEX (IBEC)	Industrialized Building Exposition and Congress
IRAP	Industrial Research Assistance Program
ISR	Institute for Social Research
KASC	Knowledge Availability Systems Center
MIT	Massachusetts Institute of Technology
NAHB	National Association of Home Builders
NASA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NCEL	Naval Civil Engineering Laboratory
NCMHI	National Clearinghouse for Mental Health Information
NIBS	National Institute of Building Sciences (Standards)
NOL	Naval Ordnance Laboratory
NRCC	National Research Council of Canada
NRCL	National Research Council Laboratories (Canada)
NSF	National Science Foundation
NSL	National Science Library
NTIS	National Technological Information Service
PIE	Publications Indexed for Engineers
PNW	Pacific Northwest Forest and Range Experiment Station
PSW	Pacific Southwest Forest and Range Experiment Station
R	Research
RANN	Research Applied to National Needs
RAP	Research Applied to Public Works
RDC	Regional Dissemination Center
REDE	Research and Design Institute
SBA	Small Businesses Administration
SBC	Systems Building Center
SHE	Subject Headings for Engineers
SSIE	Smithsonian Science and Information Exchange

TIS	Technical Information Service
TUD	Technology Utilization Division
UDRs	Urgent Data Requests
URRBI	Utilization of Research Results in the Building Industry
USDA	U.S. Department of Agriculture
USDAFS (FS)	U.S. Department of Agriculture Forest Service
USNCCIB	U.S. National Committee for CIB
WESRAC	Western Research Application Center
WGA	Weekly Government Abstracts

PART I: NARRATIVE

INTRODUCTION

Research and development beget invention and innovation. Care must be taken that innovation is not propagated wholly for the sake of innovation itself. Nonetheless innovation of products and processes in the delivery of buildings which will reduce costs and maintain quality is the ultimate goal of research and development efforts. In the complex and fragmented building industry, barriers exist which resist implementation of innovation. Would-be early innovators have a difficult task gaining acceptance from many sectors. However, if all barriers put up by manufacturers, unions, regulatory bodies (code and zoning boards, insurance companies, banks) were overcome, the consumer just might be found to be the most resistant of all to change.

It is said that technologies exist today to create a revolution in the field of building. Unfortunately, at this time when the need for physical facilities suggests a revolution if the need is to be met, change remains essentially evolutionary.

An Executive recognition of this need in housing in the 1960's led to federal programs to establish an effective means to meet the demand for housing production. Along

the way the goals became watered down and although some achievements can be shown, the original objectives have not been met. An unintentional by-product of the program exemplifies the "steamboat effect" -- the rationalization of conventional building methods (on site) as a means of competing with industrialization of building systems (off site). All things considered, it appears that it will take a natural or man-made disaster of catastrophic proportions for any significant, large-scale change to occur in the housing field.

Nonetheless, while words are waxed prosaic, and occasionally an innovation slips into use, a feeling is becoming stronger that times are changing. Architects have been finding traditional "jobs" harder to get. Leadership roles are changing subtly.

In October of 1970 the first Industrialized Building Exposition and Congress (IBEC, subsequently changed to INBEX) was held in Louisville, Kentucky.* Not only were many European industrialized building systems represented, but every form of in-factory building component and method thereof that has come down the pike under one name or

---

* Conferences and sessions on industrialization in building have been held since the 1950's, but neither on the scale of IBEC/INBEX nor with the fanfare that preceded IBEC/INBEX.

another, had the "systems" label stuck on it and was there in the biggest hardware trade show (with software, process seminars for 10,000) the U.S. had ever seen. The number of architects in attendance bespoke the concern of that profession with its future. What did it all mean? Where did they fit in? Most importantly, how could they assume or regain control of the new building team?

A First Step Leading to the URRBI Study

Back in Boston an attempt was made to answer some of these questions. Between the Decembers of 1970 and 1972 approximately ten round table discussions were held at the Boston Architectural Center. These discussions dealt with problems and potentials of systems building, particularly as viewed by architects. Architects comprised a majority of the participants; however engineering, developer, manufacturer, legal, and government interests were also represented as well as the architectural press. One problem area soon became manifest and prevailed throughout the diversified presentations and discussions: information was lacking which could enable decision-makers on the building team* to effect changes in the delivery of the built environment.

---

* Apparently the "building team" constitutes a "new" practice of teamwork -- as applicable -- among user, clients, architect, engineer, fabricator, developer, contractor, lawyer, and financier.

A Second Step Leading to the URRBI Study

In November 1971 an International Systems Building Round Table Conference was held at the B.A.C.* with federal support from the National Science Foundation. Thirty-six experts from North America, Europe, Peru, and Japan, with two hundred participants from client, user, government, designer, contractor, developer, manufacturer and financier groups, representing thirty North American states and provinces came together to discuss the process of systems building through case histories, panel discussions and smaller seminars.** Again the lack of a centralized, useful information source was unchallenged as one of the main problems facing these decision-makers.

Subsequently a proposal was submitted to the National Science Foundation for funds to conduct a feasibility study for the establishment of a regional prototype of a national resource center for the building industry. The NRC would include a clearinghouse of information.

Certain organizations already exist which carry on

---

* Copies of the Proceedings can be purchased from the Boston Architectural Center, 320 Newbury Street, Boston, Massachusetts 02115.

** Three building types discussed were housing, educational and health care. The roles of participant in systems building were the subjects of nine seminars.

related if not similar functions, however fragmented. The concept of a National Institute of Building Sciences (or Standards)* is a few years old; and that of a Building Research Information Correlation Service** is also being developed. A much earlier Building Research Institute attempt to carry on a systematic reporting of building research resulted in the "Building Research Directory" being published annually for a few years until funds ran out.

---

* NIBS is described in Part III.

** BRICS is described in Part III.

The URRBI Study

It became apparent that an important issue should be studied as a preliminary to investigating the scope and appeal of a resource center. Just why was information not available to practitioners? Was it from a lack of research; from poor disseminating mechanisms; from lazy practitioners; or some combination of these?

First, the amount, kind, source and availability of information -- primarily from research -- needed to be identified. Ultimately this study was commissioned by NSF for the purpose of identifying, in a single document, the scattered sources of research information relevant to the building field*.

---

* Because we are concerned with implementation of innovation, which can be defined as the application of an invention, itself the result of research and development, the discussion which follows refers primarily to applied rather than theoretical research.

Scope of the URRBI Study

NSF summarized the proposal as follows:

"A serious problem in the building industry is the lack of coordination of research efforts related to the industry and the long time lag between the completion of research and the incorporation of the results in practice. As much of the building related research is conducted with public funding, the public in effect does not receive the return they should for their investment in a time when escalating costs for providing physical facilities require diligent effort to maintain or reduce these costs.

The purpose of this special study is to compile a state-of-the-art survey of current and past research dealing with innovation and other problems in the building industry and related professions in North America. This information will be published in a report which will aid members of the building team to discover

(a) what research is being carried out so as to reduce costs, maintain quality, and generally to advance the hardware and software aspects of building; and
(b) where to go for information.

Of course a great deal of information is in existence and it is hoped that this study will make it more accessible to the building industry."

The original directive was to identify, describe, analyze and compare the following:

(1) existing research;

(2) existing research organizations and other non-proprietary, professional services of research character; and

(3) existing information clearinghouse activities.

The principal investigator -- author of this report -- was given a travel budget and six months to collect and organize information for the report.

The first task was to identify prospective contributors to the study and/or contributing organizations. This was accomplished through the principal investigator's previous experience and by requesting names from several experts in the field. Personal contact generally led to additional referrals. By the end of the grant period a list of approximately one hundred and fifty persons and/or organizations had been compiled*.

Personal interview was the prime means of obtaining input, after an initial letter or phone call. Time and funds permitted personal interviews with over one hundred persons in the sample. In addition, five conferences were attended. Nearly 300 pages of single-spaced, typewritten notes from these meetings comprise the working document from which much of the narrative in this report is taken. Several feet of literature were also accumulated. What is pertinent is listed in the reference or bibliography sections.

---

* 150 does not by any means constitute an exhaustive list; however it is considered to be a significant sample under the circumstances. (See Appendix I for names and addresses).

It is unfortunate that the remaining sample could not be interviewed*. To some degree at least, this report suffers from the lack of their contributions.

Despite the title of this study, "Utilization of Research Results in the Building Industry," the scope of the study did not extend to specific investigation of receivers or users of research results, that is, the ultimate utilizers. Rather, concentration was directed towards organizations which conduct research and disseminate results of research. It is hoped that potential utilizers will have access to this report, and find the selected directory of research and dissemination organizations useful. Likewise, if the discussions in this report hit vital nerves which prod practitioners into action which results in problem awareness, definition and solving, the study is successful.

The numbers of attendees at conferences as well as subscribers to journals and other information disseminating services substantiate the premise that practitioners are eager to keep abreast of current technologies. How many and where the other users are who do not come forward in

---

* Appendix I is in two parts: persons seen; and those recommended but not seen. As such, those in the latter category have not been included in Part III, and their information generating and/or disseminating activities have not been verified.

one manner or another could be investigated as part of a separate study.

Research sponsoring agencies are included in this report because they also are responsible for disseminating reports, and should be a reference source of researchers, researching organizations, and research disseminating services.

Halfway through the grant period, the author compiled an interpretive list of twenty-five comments and observations about research in the building industry made by the first fifty or so people interviewed. The list was sent to them and others subsequently interviewed, for their review and positive or negative comments. Over 50% were returned. This effort generated considerable discussion, and was helpful in pinpointing some of the problem areas as seen by different types involved in research and information disseminating activities.*

---

* Part II lists the 25 comments and selected responses.

FINDINGS

A thorough search of the following sources of research information would reveal, I suggest, that problems in many if not most aspects of building processes (technical, economic, political, legal, behavioral) and products are at least superficially covered by research projects somewhere:

(1) all the data bases into which are put summaries of on-going research and abstracts of completed research;

(2) shelves of researchers on which lie unpublished or uncompleted reports on research;

(3) academic libraries where mould (a) Doctoral dissertations which never reached the press or whose particulars never reached University Microfilms*, (b) most Master's theses and (c) essentially all Bachelor's theses;

(4) industrial offices for proprietary reports on in-house or contracted research; and

(5) governmental agencies for military and other classified reports which are for limited, internal distribution.

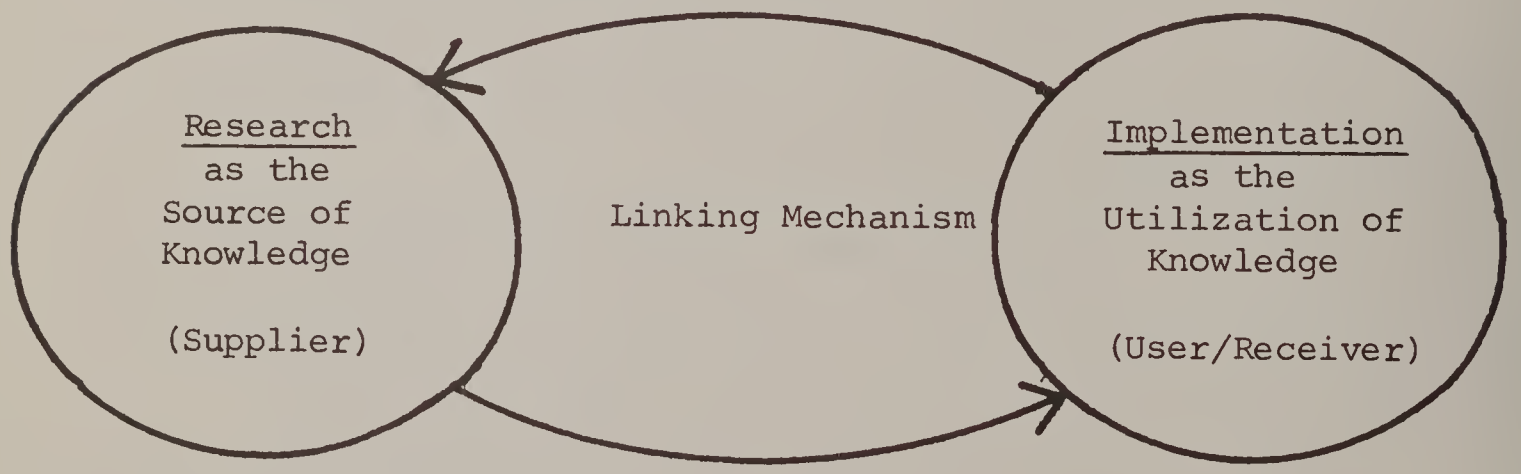
The fact that practitioners -- those individuals or groups who commission and later own and/or occupy, design, engineer, fabricate, erect, finance, and otherwise cause

---

* Described in Part III.

physical facilities to be -- complain about a lack of problem-solving information indicates that the achievements of applied research fall short of the intent.

On the one hand is the research function, on the other is the utilization function. Between is some mechanism for linking the two functions, or transferring information left to right and feedback right to left. Figure 1 represents this idea graphically.[1]



The fact is that considerable research has been, is being, and is proposed to be conducted, about which many potential users (not to mention other researchers) are for some reason unaware. This suggests a breakdown in the linking mechanism whether it be in the supplier or user environment, or independent of the two.

---

1. Adapted from Creighton, J.W. et al, "Enhancement of Research and Development Output Utilization Efficiencies; Linker Concept Methodology in the Technology Transfer Process," Naval Postgraduate School, Monterey, California, 1972, p. 3.

The worst situations depict researchers researching the wrong problems, being unaware of or indifferent to potential application of their research, not completing the writing of a research report, publishing only in esoteric journals when a wider audience is necessary if the research is ever to be applied, or indeed limiting their responsibility to the delivery of a report to the sponsoring agent. Also depicted are practitioners who are unaware or unwilling to admit that they have problems, cannot define their own problems, are unaware of sources of information and/or assistance, or are unwilling or unable to pay for information and/or assistance.

In the context of this study, the most potentially productive researcher conducts little more than an academic exercise if his results do not or cannot lead to some applied technology. Also the practitioner who exemplifies the ivory tower, or not-invented-here syndrome tends to reinvent the wheel whenever recognizable problems arise, thereby obviating, and duplicating, efforts of other researchers.

The most dynamic researchers seek out problems to research and potential users of their efforts. The most receptive practitioners on their own discover sources of potential solutions to their problems. Between these extremes can be found the majority -- those for whom studies

like this one can be useful.

In light of the present information explosion, if researchers took the time to read all that is printed in their own fields, they would find little time to carry on research. How can receivers of information, on the other hand, be expected to read all that crosses their desks in the course of a work day, much less know where and how to seek out elusive, potential problem-solving information? Even a centralized digesting and abstracting service which takes the great mass of material and puts it into more nearly manageable form for the ultimate user can only be as effective as the user profiles they receive to work from.

Research, Development, Implementation or Application, and Evaluation -- R, D, I/A, and E -- are the a to z steps for an idea to achieve commercial reality. Of course the feedback from evaluation should result in further refinements of the product or process by affecting future R and A and perhaps modifying I/A. Too often evaluation is ad hoc if carried out at all.

With respect to I/A resulting from publicly sponsored R and D, funds are often uncommitted for evaluation if indeed for implementation. Most recent Federal grant programs require inclusion of an implementation proposal.

However government policy of funding on a year-to-year basis even if a longer term proposal is approved, is sensitive to external and internal pressures. Funds to implement a development (innovation) a few years down the road may fail to be appropriated at the originally approved date. Or, as occurred with Operation Breakthrough, Congress apparently does not always understand R and D in the civil sector. In that instance, Congress appropriated a fraction of the funds originally requested, which in part caused the failure of that program to produce much in the way of product innovation.

Industry sponsors R and D -- most internally, some externally when special expertise or equipment is needed -- with profit as its primary motive. Evaluation is important in order to refine commercial products and successfully compete for their market share.

Buzz words which describe broad categories that have become the subject of national concern and the recipient of research dollars in the past several years are: environment, ecology, industrialized (systems) building, and now energy conservation. Race riots spawned concern for quality of people's built environment. Dramatic evidences of the exhaustion of our natural resources and the effects of waste disposal on the balance of life on earth

brought out the ecologists. Panic about inability to meet the needs for quantity of housing heralded the advent of the industrialized building as a panacea to our problems. Additional warnings about the exhaustion of fossil fuels and the unpreparedness of the world to use alternative energy sources went relatively unheeded until a little war in 1973 caused 10-15% of the Western world's oil supply to be shut off and threw everyone into an energy panic.

In the four instances mentioned above, the situations and writings on the walls had been evident for a long time. The shift in the status quo had to be sufficiently spectacular, however, for the general public and the policy makers to wake up, call them crises and suddenly clamor for something to be done to alleviate the untenable situations.

Immediately upon recognition of a problem of national and international proportions, money and manpower suddenly become available to investigate the problem and arrive at feasible solutions. Innovations which may result can be in the hardware (product) side or software (process) side of the delivery of built environments.

To date in the building field, research which has led to development and reached the implementation/application stage of innovation has not always succeeded in solving

the problems. According to Roberts*, innovative failure within an organization such as an industry can be attributed to the lack of one or more of five critical functions in the organization, as shown in the following table. The same functions, roles and characteristics apply to other complex organization types and are necessary no matter how interdisciplinary the effort is.

TABLE 1

	Critical Function	Critical Personnel	Critical skills and characteristics
1	Idea	Creative Scientist	creative, strong technically well educated
	+		
2	Support	Entrepreneur	aggressive, broad range of interests and activities
	+		
3	Focusing the Idea (leading to exploitation of the idea)	Project Manager	organized, sensitive to people, planner
	+		
4	Coaching	Sponsor	more senior, experienced, less aggressive
	+		
5	Useful Information (from outside the organization)	Gatekeeper	communicative, reads technical journals, goes to conferences

---

* Professor Ed Roberts, M.I.T. Alfred P. Sloan School of Management, lecture.

In a discussion of R, D, I/A and E of innovations in the context of this study, several interrelated categories can be delineated: research, innovation, technology transfer, communication, and dissemination.

A. RESEARCH

Perhaps it is unrealistic to expect or impossible to achieve an efficient system for funding, conducting and disseminating information about research in a field such as building -- which is so fragmented to begin with. Nonetheless certain shortcomings in the current *modus operandi* are obvious.

The sheer numbers of area, population, and Gross National Product of the United States suggest conditions of tremendous proportions on a national scale. The Federal government is concerned about national needs, as is reflected in its research funding activities. The many local social, economic and political environments which exist throughout the country affect the acceptance of innovations (and thus the utilization of research results). National efforts can be frustrated due to local situations.

In addition, the enormity of the task makes it difficult always to link the right funds with the right research

project, research locale and research team.

Duplication of effort

Some duplication of research is useful and serves as a check on erroneous, unsubstantiated findings. However, considerable duplication occurs because sponsoring bodies and researchers are unaware of similar activity elsewhere, even within the same discipline or geographic region. While it serves as an education and provides experience for those doing the research, the results cannot have far reaching impact for the same reasons that the research was duplicated in the first place: ineffective intra- and inter-communication and -information dissemination mechanisms for those who have researchable needs, those who have the physical resources to solve the problems, and those with the capital to support research efforts.

Not only does duplication of effort occur because of the imperfect means of communication, but for the same reason, serious gaps in research occur.

Financial Commitment

Too often dimes are appropriated where dollars are needed -- and then complaints are made about poor research and no development and/or application, much less evaluation.

The lack of long-term financial commitment to see research through to implementation negates much potentially effective good research effort. Few proposals include plans to monitor the implementation of an innovation. Thus evaluation can only be ad hoc and superficial at best.

Time lag between proposal submission and final appropriation of public monies can be so great that research personnel may change, as well as the original emphasis on the researchable need. Lack of continuity in funding frustrates efforts to keep a long-term project staffed and operating smoothly.

Private support for research of a non-proprietary nature is difficult to obtain because previous results from such funding have fallen short of expectations. More private support could be available if the private sector were convinced that genuine user needs were being considered by research efforts -- that is, that a commercially viable product would result. The extremes of the private sector not funding research are on the one hand that things are so bad one cannot afford to do research. On the other hand, if things are so good why get off a good thing? Industry's interest in contracting research at universities tends to by cyclical, such as when they feel the need of enticing students to go into industry upon graduation, and that sup-

ported research will serve the purpose of pre-training future employees.

What Should Be Researched ?

What is the burden on the shoulders of the construction industry (the user) in the next several years? Answer this first, and then we may be able to say where the burden of research should be placed. Indeed, one should look at the user to determine what is to be researched rather than what the scientist or researcher perceives is the need. It is not easy to identify those with problems or to get them to come forth. Yet ideas which lead to research and successful application tend to come from practice in the field, such as industry marketing groups. They are not self-generating in the laboratories. Unfortunately many studies undertaken have been user surveys which do not succeed except to "reinforce the stereotype."

State-of-the-art studies are logical first steps in developing research programs. Unfortunately this step is often put down by funding agencies who feel that the prospective researcher should include a state-of-the-art statement ("do his homework") as part of the proposal in order to justify that his piece of research needs to be done. While this attitude is often justified, the time required to complete an adequate state-of-the-art study can

approach the magnitude of a full-scale, several month study. Few researchers can afford to spend unfunded time in such endeavors.

State-of-the-art surveys can give a picture of what is being researched. However, they will not automatically indicate where voids are.

Housing is cited throughout this narrative in the context of the great need for more and better housing at a price people can afford. Since this has not been achieved using existing products and processes, considerable money and manpower have been expended to introduce innovation, usually in the physical building itself. Results have not been far reaching. Perhaps research and innovation have been concentrated in the wrong places. The accompanying table illustrates the point.*

TABLE 2

	Percent total cost	Number of "people" involved
Money	42	1
Land	25	5
Building	33	40
	100%	

One third of the total cost of delivering a house is the building. However, upwards of forty different "people" provide their commodities to make up the house.

---

* Professor Arnold Rosner, Dept. of Architecture; University of Washington, Seattle, discussion.

An innovation in one of these forty areas is not going to affect greatly the cost of housing. It has been said that if the structure were given away, it would only reduce the cost of housing by fifteen percent.

The largest cost of delivering housing is the cost of money itself -- 42 percent. And only one "person," the bank, controls the money. Perhaps it would be more fruitful to influence the one entity which controls such a large percentage of the cost of housing -- that is, direct research to that area -- than to try to attack separately the forty fragmented contributors to the physical building itself.

For some reason problems of new construction or new products are more apt to receive attention and financial appropriation than the problems of existing buildings and old products which could find new uses. However, the present energy crisis may well change this attitude. For example, it may bring to a halt the demolition of older urban areas. Massive brick and masonry walls besides being structural have excellent inherent insulation properties. Newer structures may not be so inherently energy conserving, but have long remaining life expectancies. Therefore, retrofitting of existing structures with energy saving mechanical systems and facade treatments will have greater immediate impact on energy conservation in buildings than new con-

struction which may be several years from occupancy.

Insulation is far behind in using new technologies because the status quo was profitable enough. Current pressures external to the insulation industry should change this.

While various efforts including this study attempt to point out who is doing research and what research is being conducted -- that is, the state-of-the-art -- no one is doing a study of how practitioners such as architects are using research results. For example, how much research by environmentalists or behavioralists is being used by architects?

Who Should Do Building Research ?

Architects do not design all of the built environment. They do have the potential to influence much of the built environment. Their future role on the design team depends largely on their ability to work with a multidisciplinary team and with innovations. The delivery of the built environment is a management process which includes but is not dominated by architectural input. Research in building is largely a management, not a design process. Traditionally architecture has not been analysis/research oriented. Understanding how to analyze problems (do research) as well as synthesize solutions is essential if architects

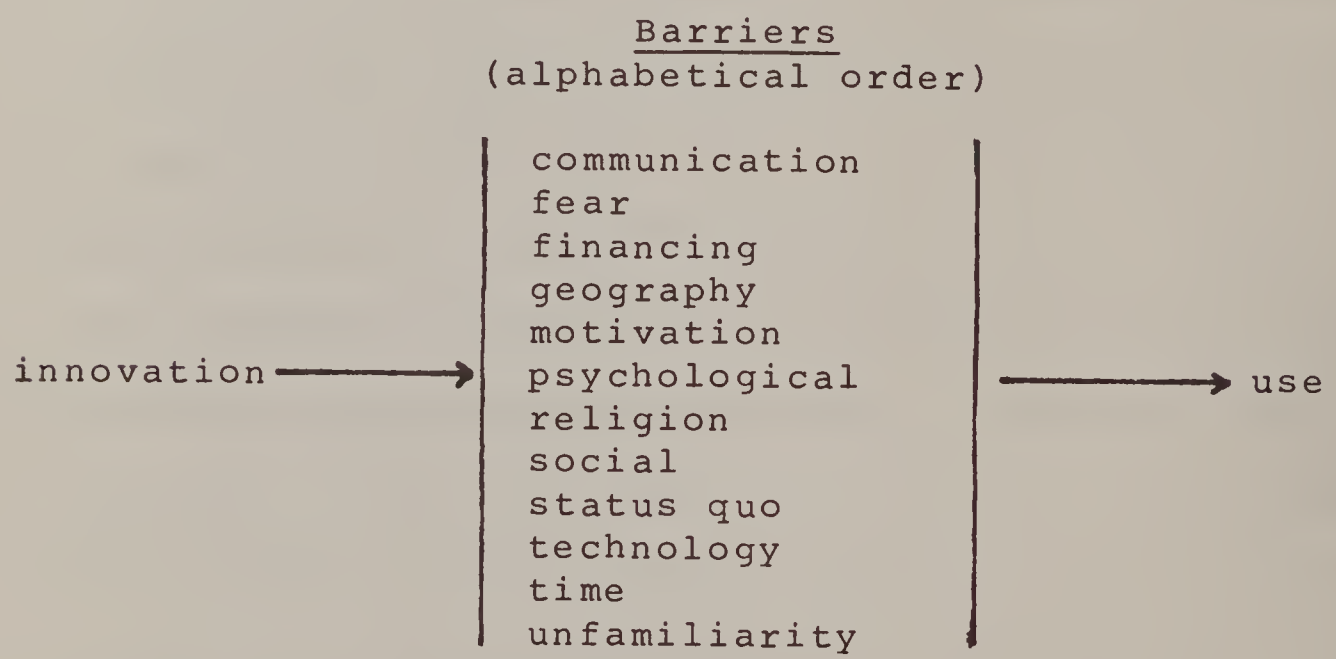
are to be a decisive part of the building process.

Some valid questions arise concerning the practicability of architects doing research. Architecture is an art form: is there R and D in art? Certainly, but is it in a form translatable to problems confronting the delivery of built environments? Should not the architectural student be allowed to pursue his artistic development rather than force him into unfamiliar areas which may be antithetical to architectural concepts? The present job situation in the architectural profession suggests "no" to the last question. Times are changing more rapidly than a generation of students can cope with unless they are given the necessary research tools in the formative years of their architectural education.

Despite the quandary of architectural students doing research, many university architectural departments are including programs of a research nature in their curricula. In some cases multidisciplinary masters and doctoral programs have developed. Architectural programs have combined with gerontology, psychology and sociology, to list just three other disciplines.

B. INNOVATION

The several barriers to implementation of innovations are often interactive, which makes their alleviation all the more complex and difficult. The accompanying diagram illustrates some barriers.



If the status quo is sufficiently profitable, change or innovation is difficult to introduce or induce. External pressures are more apt to cause change than internal ones. Motivation of people to do something that has not been done before is hard to encourage. Some fear that their jobs may be eliminated. If an innovation causes a change in the appearance of a product, its chance of acceptance is lower than if it appears the same. For example, innovations in housing have a better chance of being tested in a transient type building such as a motel than in rental housing. At

the same time, however, innovation is slowed down in industrialized building because people reject too much sameness -- which is part of the economic viability of industrialized building.

Financing innovative processes is another problem. For example, if a building can be largely finished in an off-site factory but the payment not made until erected on the site, the system builder may find it very difficult to meet his own bills for other components of the building.

The time lag between an idea and commercialization is a considerable barrier. It may take fifteen years. With luck a minor change rather than a real innovation could be accomplished in two to four years. If the right product is introduced at the wrong time ("before its time"), it may experience extreme difficulty or fail in being used later.

In the construction field, a problem in research is to get product development people application oriented.

In any event it is essential to create change <u>with</u> rather than <u>to</u> people. If people who will be affected by change actually help in its occurrence, they may not reject the change so much.

C. TECHNOLOGY TRANSFER

Technologies exist in many fields such as aerospace which may be successfully applied in the building field if the necessary technology transfer is accomplished.

Three kinds of technology transfer can occur:

(1) technology transfer within a system itself such as the building trade. In this case the problem is to get the information into the system. It is necessary to "sell the uppers." That is, it is necessary to convince the one above who has more authority that the idea is worth implementing.

(2) technology transfer outside the system, which has already been developed but intended for another use. This becomes an information system problem. The question is, does the user know that the technology is available?

(3) technology transfer of an idea within a system which people in the system think might be useful outside the system. What is the incentive for someone to get the technology to other areas? This is a public relations job. For example, the military needs to convince taxpayers that they are getting more out of their dollars than military applications.

D. COMMUNICATIONS

Communication, or information transfer is undisputed as the biggest problem confronted by those involved in sponsoring, conducting and disseminating research. Poor communications constitute a formidable barrier to utilization of research.

Communications are best accomplished on a person-to-person basis. For example, each person or group interviewed during this study suggested one or more other persons or groups who might also be helpful. The situation boils down to: under present mechanisms, it is impossible to know all that is going on. One has to do the best with what one's got. The key to success can lie in knowing (or finding) linkers or gatekeepers to talk to, someone attuned to the problems of the practitioner and the researcher; someone who can transmit research results to the practitioner as well as feedback from the practitioner to the researcher.

With the limited financial commitment on the part of funding agencies (private or public) and their lack of commitment to carry a research project through to implementation, we cannot expect a universal, cure-all system of information exchange to be established. Even if it were,

problems arise in advertising and selling the service -- or even giving it away. Who needs the service? Quite likely it is those who are not aware of it and do not use it for one reason or another.

Horizontal communication among peer groups as well as vertical communication from producers of knowledge (researchers) to utilizers of knowledge (practitioners), with the feedback from utilizer to producer, fall into definable patterns. One asks the closest peer a question before scanning the office library or using the telephone. The search for an answer becomes more complex only as a ready answer becomes more remote. Just as a library is not visited after some variable number of unproductive searches, a person is contacted for information until he does not produce an answer once or twice.

Information is transferred most easily through a circle of people interested. An experienced researcher or person tends to know where to go for information. Professional meetings are a key means of communicating. While this form of communicating is perhaps too horizontal, it is important because often research in progress is discussed which will not be published for a couple of years. This also points up the general problem of the lag between research completion and publication.

Vertical communication often suffers because people tend to write in the language of their peers. Potential users of research tend not to read such professional journals because they do not understand the language. Journals published as research documents rather than how-to-use-it reports are not very useful to a practitioner. Unfortunately the "awards" system for publishing in academia where much research is conducted gives zero credit for publishing in trade journals which reach people in the field.

If one looks at research journals in fields other than architecture, one can surmise the state-of-the-art. But in architectural journals one sees styles and facades rather than how to build, or costs. There is no accumulation of objective information, no analysis or evaluation of results, no feedback -- no learning from mistakes.

Architects, for example, are trained visually and graphically rather than verbally. Yet research is typically presented in words and graphs and computer printout. Either architects have to be retrained or a different communication system devised. It has been suggested that engineers would respond better to pictures than words, too.

E. DISSEMINATION

Dissemination is the communication of research results to practitioners, both internal and external to a research function. It has been alluded to in the previous section. Researchers are not disseminators.

Most disseminating "centers" are push mechanisms which catalogue, retrieve and distribute hard or film copy of reports. They fall short of their goals in several ways:

1) they catalogue everything indiscriminately, and poorly.

2) key wording systems for retrieval are unsatisfactory and often either too general or too restrictive. For example, computerized searches in one area may miss a possible application of a process or product for a problem in another area.

3) they do not know who their potential audiences are or how to reach them. Information dissemination is a push/pull activity in which the disseminators need to interact with users to pull out what their problems are.

Effective ways of advertising that information is available can include: ads in newspapers to reach specific audiences, such as the Wall Street Journal; trade shows for small businesses; workshops and seminars when research

is finished; packaged slide-cum-cassette shows to be distributed regionally.

The Technical Information Service of the National Research Council of Canada is a good example of an effective pull/push organization. The Technology Utilization Division of the Small Business Administration in the United States is a valiant effort to find out problems of smaller firms which usually cannot afford expensive services of information disseminating groups, but who are in the greatest need of such assistance. Unfortunately too few field representatives are available in TUD. Even more unfortunate, since a dollar value cannot easily be placed on the TUD's results, it faces probable abolishment.

CONCLUSIONS

The following factors describe the present situation in which organizations and individuals must cope with problems of effectively and efficiently sponsoring, conducting and disseminating information about research in building, and the problems of implementing innovations in the built environment.

1) In the context of a national R, D, I/A and E model, both the vast size of the country and the diversity of geographic, climatic, social, economic and political conditions are inhibiting.

2) The building industry is too fragmented.

3) Research seems to be as fragmented as the building industry, with little understanding of and planning for how research fits into a whole, larger effort.

4) Vested interests of governments, industry, universities, and professional organizations even with the best of intentions can bias research efforts such that the optimum integration of funds, researchers, disseminators and practitioners is not achieved.

5) The practitioners who put the results of research to use are elusive characters. The ones who really need the help often do not come forward. Yet proper understanding of their problems can lead to the most productive research.

6) Linking mechanisms for transferring knowledge from researcher to practitioner -- and the feedback loop -- are too little understood and ineffectively managed.

RECOMMENDATIONS

Perhaps the most significant failure of our present "system" of research is ineffective communication of knowledge. The communication of problems must be facilitated in order to conduct the right research. Communication of knowledge must be facilitated in order for research to be effectively utilized. Although local or regional problems exist, so many researchable aspects of the building industry are of national scope that the Federal government, through one or more of its agencies should commit funds for a long-term, eventually self-sustaining building research information "pull/push" program*. The recipient of such funds must have an adequate full-time staff to carry through the program. Enough good ideas, proposal and people are already available that a proper matching of these components with funds should be able to achieve success.

---

* The Appalachian Mountains and the Mississippi River need not be the physical barriers they appear to be for information flowing east to west and west to east.

Secondly, the findings of this study concur with a current Administration attitude demonstrated by recent cutbacks or freezes in Federally funded research. Too much research in building has been contracted with no evidence of what the research has proved; we should apply some of the findings before more research is conducted. However, without Federal commitment to carry research through implementation/application and evaluation stages, the desired applications are unlikely to occur. Therefore, it is also recommended that research programs not only include application and evaluation phases in their proposals, but that sponsoring agencies extend their commitments -- subject to review, of course -- so that innovations can be demonstrated and evaluated.

PART IIA

On the following three pages are reproduced twenty-five comments and observations about research in the building industry, as compiled by the author from interviews held during the first half of the URRBI Study. They were subsequently sent to those interviewees and as many others as time permitted, with a request for positive and negative criticism. Over 50% were returned, most with considerable discussion written in the 3" margin provided.

Note that next to each question are three boxes labeled "A", "Q", and "D" -- "agreed", "qualified responses", and "disagreed", respectively. The numbers refer to how many answered in each manner; the total number of responses to each question are given at the right. The "+", "-", or "0" beneath the "Q" box indicates that a majority of the qualified responses tended towards agreement, disagreement, or an average, respectively.

COMMENTS AND OBSERVATIONS ABOUT RESEARCH IN THE BUILDING INDUSTRY	A	Q	D	Total
1. The Construction industry wants to use more raw materials and architects and builders are prepared to use new materials. However they have the problem of learning about their existence and how they are used.	22	17 0	9	48
2. Manufacturers resist innovation because of the market -- they will not commit time or money to develop new materials and products because of the risk involved.	15	17 +	18	50
3. Failures (of an invention or innovation) occur not because of low technical quality of an idea, but because of the management of the process of getting it to the public.	20	21 +	6	47
4. Management must approve the utilization of research results or the research is nothing more than an academic exercise.	29	18 0	3	50
5. The problem is not the lack of information, but a reluctance of others to pay to utilize available information.	7	28 +	10	45
6. An invention is something new that is proposed, whereas an innovation is the results once that proposal or invention has been applied in practice. Predictability is required to take an invention to the stage of being an innovation. That is, results must be predicted, knowledge must be used and the experience applied. Predictability is the antithesis of creativity: engineering is based on predictability whereas architecture is based on creativity. With his concept of creativity the architect denies knowledge and predictability. If he takes an invention, it is on faith with little understanding of it or the innovation it could become, or its effect on other aspects of building. Since the purpose of research is to provide knowledge, it is thus that architects do not understand research. We need a new breed of people -- building engineers, environmental engineers.	7	28 -	15	50
7. The design process, or decision-making process, should become a predictive process rather than a reactive process. That is, look forward to when information would become productive.	21	17 0	3	41

	A	Q	D	Total
8. The architect falls into the ivory tower syndrome: if something was not his idea he is likely not to use it. Thus the architect himself is a barrier to innovation.	14	26 (0)	4	44
9. In this profession (building) we are just not search oriented. We build on past knowledge and what is available.	17	27 (+)	1	45
10. Researchers do not look into libraries to see what has been done over the years. Many proposals submitted to funding agencies show lack of knowledge within the application of similar proposals from other parts of the country.	15	30 (+)	1	46
11. Researchers don't trust architectural journals because there are no adequate referee journals in architecture. There is no knowledge in American architectural journals.	8	18 (+)	4	30
12. Problem of publishing in a trade journal is that even though one gets a lot of enquiries, the researcher will not learn anything about the worth of his research -- that is, there will be no discussion. On the other hand, if published in a professional journal it will never be utilized, but it will generate considerable discussion among peers.	7	28 (-)	1	36
13. Problem with directories of research projects (and information clearinghouses) is that researchers are bombarded with requests for their reports, and not very intelligent requests.	11	30 (+)	2	43
14. Face-to-face contact is the number one method of communicating with one's peers. Any writing that is done is done for other than peers.	7	37 (0)	4	48
15. Information systems are designed to serve some unique purpose and population. So it is not exactly re-inventing the wheel to develop one's own information system.	13	24 (+)	0	37
16. "Research results can lose something in the translation." The researcher's interpretation of the research program may differ from that of the user of the results. The researcher may present results in a form unfamiliar to the user.	18	26 (+)	1	45

	A	Q	D	Total
17. We need "service-oriented researchers", that is, those who actually perform a service to parc-titioners. These are synthesizers of research, or linkers who can get the results from the researcher and take them to the user. Lack of synthesizers or linkers is a barrier to implementation of innovation.	22	26 +	0	48
18. One barrier to implementation of innovation is the lack of motivation of people to do something that has not been done before.	16	27 +	2	45
19. Another barrier to implementation of innova-tion is the lack of continuity in leadership in cha change and innovation.	11	17 +	2	30
20. There is a general lack of feedback when research results are utilized, so it is difficult to know how useful the research has been, or to see how future projects can benefit.	16	27 +	1	44
21. We cannot discover voids in research by just looking at what has already been done. We need to inquire about what people need to know.	18	27 +	0	45
22. Intercommunications about research projects is good among universities, it is bad between industry and universities, and bad from industry to industry.	7	35 -	5	47
23. Much of industry-sponsored research at univers-ities is meant to graduate people better qualified to enter and be useful to the industries.	12	24 +	3	39
24. However, industry-based research is profit motivated. University-based research is for edu-cation purposes. University-based research is sponsored by industry tends to benefit the univers-ity and the student more than it does the industry.	9	29 +	1	39
25. Government-sponsored research tends to be limited to one Administration, and is only funded for one year, with the second year promised.	9	26 0	3	38

PART II B

Selected responses, which hopefully reflect the consensus of those replying, are also reproduced on the following pages.*

Note that next to each question at the top of a page are three boxes labeled "A", "Q", and "D" -- "agreed", "qualified response" and "disagreed", respectively. The numbers refer to how many answered in each manner.

Many of the "agreed" replies were one word or phrase connoting agreement. Likewise for "disagreed".

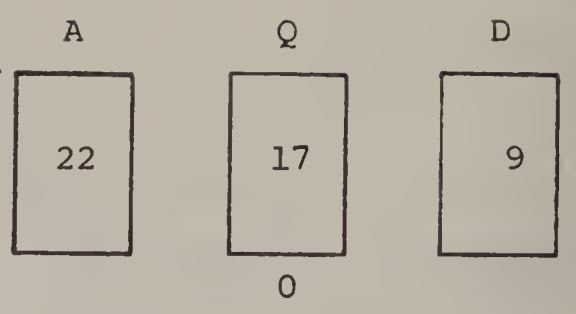
"Qualified" replies ranged from maybe, partly true, and not entirely true, to qualified agreement or disagreement. The "+", "-" or "0" beneath the "Q" box indicates that a majority of the qualified responses tended towards agreement, disagreement, or an average, respectively.

Most of the replies reproduced on these pages came from the "Q" category.

---

* Question 6 evoked the greatest discussion, the longest responses, and the strongest language.

1. The Construction industry wants to use more raw materials and architects and builders are prepared to use new materials. However they have the problem of learning about their existence and how they are used.



SELECTED RESPONSES

-The basic question is to determine whether the new material is any good!

-and to what extent they have been tested, to what extent they are backed in case of failure to perform.

-New and interesting materials are available but design data on these materials is often scarce or non-existent.

-Builders and architects are not very eager to use new materials unless the manufacturer is strong and gives excellent warranty conditions. A basic problem is the "non-availability" of unbiased product information. Major efforts should be made regarding quality standards and norms; also with regard to product compatibility for products.

-Dissemination of information is extremely important, however the garbage needs to be screened out or the problem is overwhelming.

-This is probably accurate although once new materials are put into production there is usually no shortage of publicity.

-The "industry" would like to use less raw material, reduce labor; if architects could help achieve this goal they would be employed. The principal problem in using new materials is to prove their performance. (Example: plastic pipe).

-Architects are beginning to realize the need for using old materials in new ways -- that is, recycle building components, etc. so as to conserve resources...

-This is too broad. There is a communication problem to architects. But in general they do pretty well on getting input on new materials. It is the builders, perhaps because of the trade workers, who resist new materials.

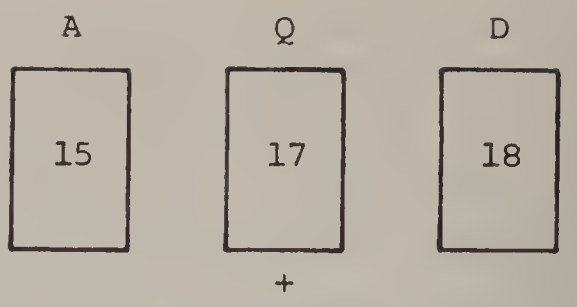
-One of the industry's big problems is that when we use new methods or materials we seldom follow up and evaluate their performance after 1, 2, 5 years, etc. Result: the construction industry favours known "bricks and mortar"; but designers look to "new" materials and methods. But a big information gap does exist.

-Only partly true. Builders often resist change -- fear of unknown, etc.

-Not true. The architect is not willing to use new, i.e. not tried and true material. Reason: his professional reputation is at stake and he does not want to use his client as a "guinea pig" when poor material (product) performance can hurt future commissions.

-A broad, unsupportable generality.

2. Manufacturers resist innovation because of the market -- they will not commit time or money to develop new materials and products because of the risk involved.



SELECTED RESPONSES

-Of course! Who expects a manufacturer to innovate in order to lose money?

-Agree very strongly. This is one of the greatest hindrances to development.

-True. "Risk" is very real in terms of legal liability; but also because 85% of new products fail.

-Well, of course this is partly true. How else could business function? Some industries take more chances than others; for example, aerospace. The obvious concomitance is that the riskier ones are less stable, and prone to big headline-making cost overruns, etc.

-Truer of the large, established firm than of the new entrepreneur. The successful need not take chances.

-Manufacturers are reluctant to commit time or money, unless forced to do so by competitive pressure.

-Not completely true. Manufacturers will take a risk on an innovation if they have a chance for success.

-Literature is shy to admit this but tends to agree that profit motives interfere with innovation.

-Disagree. Manufacturers need the information before they take the risk. Manufacturers will accept risk if sufficient profit is involved.

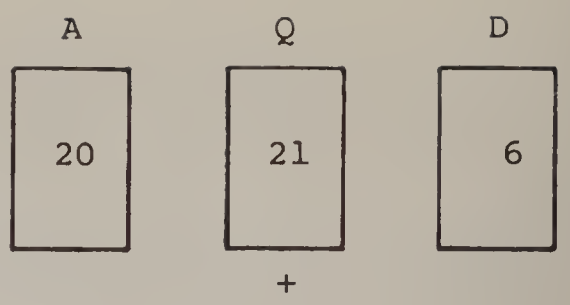
-Disagree. I think competition spawns innovation and manufacturers actively pursue new developments.

-Just the opposite! Progressive manufacturers develop both materials and markets at considerable risk.

-I strongly dispute this claim. New processes and products are constantly being developed in response to construction needs. One only needs to view expositions such as INBEX or NAHB Home Show to see evidence.

-Manufacturers are willing to take risks but they want to risk time and money only in areas which they understand reasonably well. Many manufacturers who want to move into building products development do not have sufficient experience in the particular areas. If this situation shall improve, more architects and building related engineers must move into building products development, employed by manufacturers or as consultants. One of the best examples for not well developed potential of building products development is in the plastics industry. To some extent the move of architects to the roles of developers and systems "inventors" is related to this problem.

3. Failures (of an invention or innovation) occur not because of low technical quality of an idea, but because of the management of the process of getting it to the public.



SELECTED RESPONSES

-Taking "management of the process" in its broadest sense I agree.

-Both reasons contribute to failures -- poor technical quality and poor management.

-all types of management, including management of the conception of research and development process, need to undergo continual re-evaluation...

-Failures frequently occur because of improper or nonexistent market analysis. Need simply is not there.

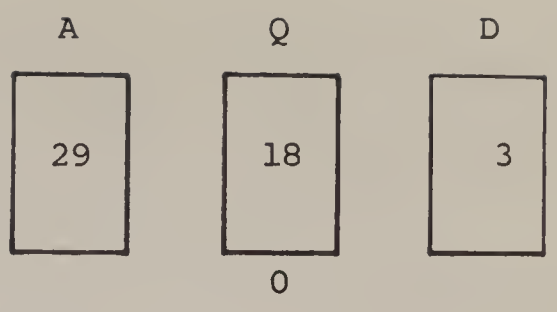
-"Failures" also occur because the idea was impractical -- but this isn't known fully until it's tried. Happens every day in research and development. I disagree with the statement.

-This is often true. Unfortunately low quality products succeed in many cases because of good "salesmanship". "Low cost" is too much stressed in the USA.

-Not necessarily -- generally it takes 35 years for an invention to work into general market.

-The public has always been reluctant to change. Hence the problem is successful selling.

4. Management must approve the utilization of research results or the research is nothing more than an academic exercise.



SELECTED RESPONSES

-Hard to understand why not authorize research in first place if they don't intend to use it.

-Whether this conclusion is true or not depends very much on the judgment quality of the management.

-If the results are valid they will see use.

-True if research is promising it should be taken to next steps of prototype and market testing.

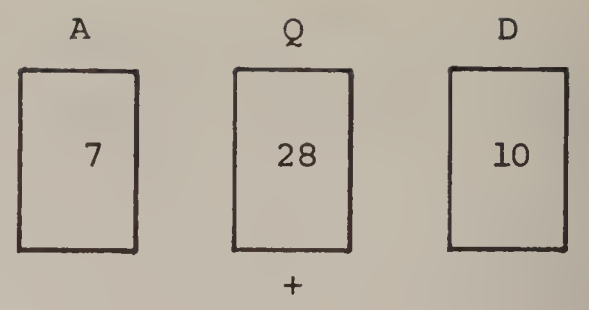
-Not only approve but be convinced of the payoff in using it -- Researchers often are very poor salesmen.

-Management approval is necessary for effective development of research. But with or without approval, the knowledge has been obtained.

-Not true. The power of utilization lies with the person "on the board". Management never hears of research.

-Who is Management?

5. The problem is not the lack of information, but a reluctance of others to pay to utilize available information.



SELECTED RESPONSES

-American industry has been used to free information for so long they are reluctant to pay now. Costs for some information services are unreasonably high. Also many information systems are designed to suit the whims and conveniences of the designer without true regard for the needs of the user. There is a wide communication gap between the supplier and the user. There is also a confidence gap -- the scientist, engineer, architect, etc. lacks confidence in most information activities and turns to his peers.

-Surely an oversimplification -- the failure today to apply known information or technology is a much more involved matter than simply reluctance to pay the cost.

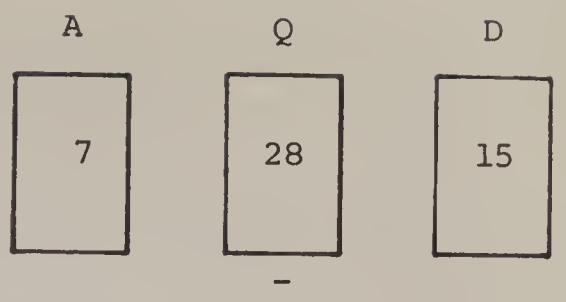
-The economics of information are only part of the problem. The problem is equally one of attitude.

-Don't believe "pay" is the word -- are not motivated to use the information. Don't want to do their own homework to use new techniques.

-The key word is available. People are happy to pay for real information.

-Believe researchers and users would rather obtain the information by personal contact rather than having to cull through a mass of information.

6. An invention is something new that is proposed, whereas an innovation is the results once that proposal or invention has been applied in practice. Predictability is required to take an invention to the stage of being an innovation. That is, results must be predicted, knowledge must be used and the experience applied.



Predictability is the antithesis of creativity: engineering is based on predictability whereas architecture is based on creativity. With his concept of creativity the architect denies knowledge and predictability. If he takes an invention, it is on faith with little understanding of it or the innovation it could become, or its effect on other aspects of building. Since the purpose of research is to provide knowledge, it is thus that architects do not understand research. We need a new breed of people -- building engineers, environmental engineers.

SELECTED RESPONSES

-Some architects are already very good architectural and engineering designers. The statement is a little too strong because it does not give the really good architects credit for their competence.

-I can't agree with these words. Certainly the architect must be creative and concern himself with the appearance of the structure. All other aspects of a building are engineering. Thus we need both kinds of people and they must work together. Some men can combine both talents, but it is rare. But we do need both. A building designed by an engineer is rarely a beautiful structure. Engineers should be exposed to architecture courses. Architects now get engineering training.

-I'll accept the idea that innovation is the process of applying an invention in practice. This involves the Design Process so predictability is involved if the Design effort is to fulfill specified objectives. I fail to follow, however, the idea that predictability and creativity are opposites and therefore that architecture cannot be predictable. There are among my architect friends those I would call "facade" architects. They are forever conceiving new geometrical enclosures, forever hopeful that they will be functionally valid. These men are poor representatives of the architectural profession and need retraining. The design process cannot be a solo effort so we must augment the architect with other disciplines -- to broaden the design team to make effective innovation possible. Perhaps the new "breed" will be retrained architects.

-False assumptions. Predictability need not be antithetical to creativity. Architecture is based on predictability of human behavior. Needed perhaps are sensitive programs for improving interaction and exchange of ideas among architects and building researchers, etc.

-I disagree that "Predictability is the antithesis of creativity". We can be "predicting" as we are "creating" and they are going in the same direction.

-Creativity is not operating in a vacuum. It is very much related to intuition and intuition is a help in decision making based on experience and problem related data.

History shows that many engineers have been extremely creative while architects have pushed innovation by knowing in many situations more than engineers.

-Architects rely on prediction as much as engineers. It is a different type of prediction than symbolic -- it is analogue. What architects need are people who can exercise judgment about situations when asked questions, not calculators of an initial guess to the 15th decimal point.

-Not a new breed of people, but people who understand the value of research..then apply it..There is predictability and creativity in architecture and in most instances are mutually compatible.

-We need a better two-way cooperation -- maybe not new breed; just a new climate of sharing between architects and engineers -- engineers do not share in design payoff in many cases in an equitable way.

-A good architect does understand technology and recognize the need for predictability. The incompetent hides behind the mystique of creativity.

-Boy, you are really taking on the world with this one. To begin with, I don't agree with your definitions but I'll work with them.

You are dead wrong about predictability being the antithesis of creativity -- the two are not connected in any way. Your reasoning would have me believe that there is no such thing as creativity in engineering or any science with a high level of prediction at its fingertips. Architects would like to believe this but it just isn't so. Evidence:

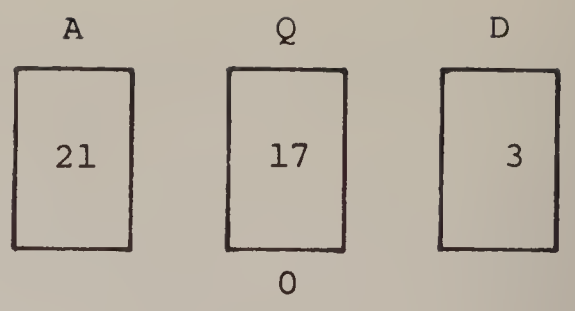
- .Designing the Brooklyn Bridge was a highly creative act in its day yet the engineering was all predictive.
- .Using mathematics, A. Einstein created the theory of relativity -- a highly creative act using a very predictive medium, i.e. mathematics.
- .Discovery of DNA coding was a highly creative act in the field of genetics; yet the biological and chemical knowledge needed to do it was -- and is -- highly creative.
- .Computer programming is totally predictive yet it takes a creative act to devise programs such as the navigation programs for the moon shots.

etc. etc.

The point to all of the above is to show that the architectural aversion to predictability on the grounds that it hinders creativity is not justifiable.

None of this says that predictability is necessary for creativity either -- there are an equal number of creative acts in fields which do not have a high predictive capability as well. The point about predictability that you seem to be missing is that without it there is no control. This should not bother architects since control is what they say (and claim without justification) they can do with the environment. It is irrational for architects to claim an ability to control, on one hand, and shun prediction on the other.

7. The design process, or decision-making process, should become a predictive process rather than a reactive process. That is, look forward to when information would become productive.



SELECTED RESPONSES

-Yes, but how realistic is this?

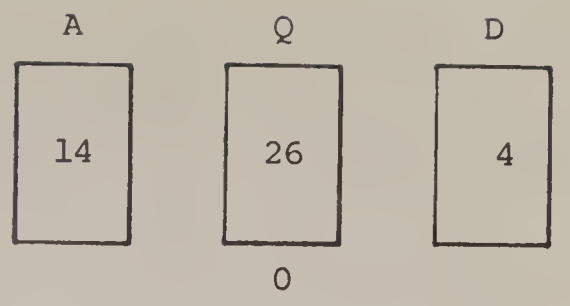
-The future is uncertain, but one can make judgments about it which may be to some degree right or wrong. The architect must act in spite of ignorance -- he cannot wait for information which may or may not help him.

-Very few buildings can be constructed as experiments. Therefore, the design must be a reactive process.

-True, although the predictions are influenced by feed-back of prior experiences. Actually, design is an iterative process.

-True -- good ideas are often sprouting ahead of schedule and get cut back by a "cold snap". Good ideas need to be put in a predictive cycle to be brought up again when conditions change.

8. The architect falls into the ivory tower syndrome: if something was not his idea he is likely not to use it. Thus the architect himself is a barrier to innovation.



SELECTED RESPONSES

-An extreme view -- but there is some justification for it.

-Of the architect of the '20's, '30's, '40's, and '50's, this is true (especially the superstars). Not necessarily true of the new architect of the '60's and '70's.

-This may be true of some but more and more we see "architecture by team". The stimulation provided helps to break down barriers to innovation.

-Correct in part but it is unfair to generalize. Much progress has been made by innovative architects who do not reject new ideas.

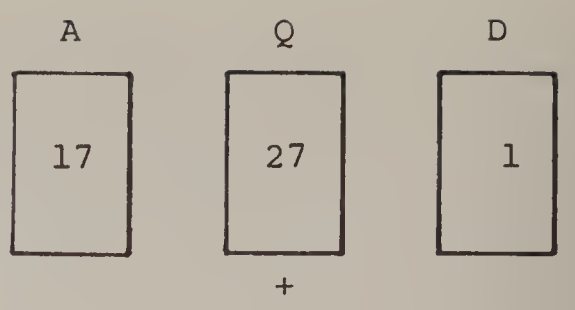
-Some architects are in love with invention rather than innovations. But it is not fair to characterize the whole profession this way. If architects were to innovate all the time, no work would get done.

-Yes, this is about a half truth. And most of this kind of attitude comes from his basic instruction in our schools where research has not prevailed.

-Why is that characteristic of architecture? Isn't this human nature? The issue is who is behind architectural journals. Journals at present serve as instruments of promotion rather than dissemination of knowledge.

-Generalities like this do wonders for some people's ego but they miss the point. New creative ideas are important and those who bring them about should hang onto them until they are shown to be invalid. If they continue to hold on and are arbitrarily blind they are in an "ivory tower" -- I think we have failed at times to challenge these people effectively and so to guide their thinking into a less arbitrary framework.

9. In this profession (building) we are just not search oriented. We build on past knowledge and what is available.



SELECTED RESPONSES

-Past knowledge may be providing the needed predictability.

-Unfortunately, so many of the new ideas are not any better -- or as good -- but we are "searching" constantly.

-For pragmatic truth, we build what will sell.

-Codes make us that way! We're practical people.

-True, to a considerable extent and for a variety of reasons. Time pressures, apprensions concerning liability, the sheer difficulties of getting anything new accepted.

-The information tools should be available, and the researcher should know about them.

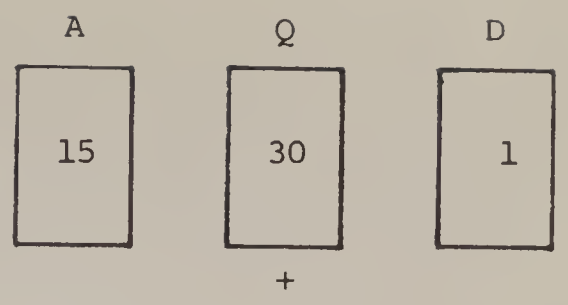
-True, but not in the way you mean it. People in the building profession spend a lot of time searching for information -- very much like the legal profession when preparing a brief. Trouble is we (like the lawyers) call this research rather than search.

-Research is based on past knowledge and then its advancement of knowledge...We are lacking in many instances the building on previous information and knowledge...This is the art of science.

-Yes, because there are very poor information channels.

-The fee structure in architecture does not allow much research for buildings which are built once. We do not have a repetitive process of building, yet.

10. Researchers do not look into libraries to see what has been done over the years. Many proposals submitted to funding agencies show lack of knowledge within the application of similar proposals from other parts of the country.



SELECTED RESPONSES

-Says something about the quality and training of the people involved.

-True for architects; also for proposal evaluators, most are incompetent.

-Part of this is due to a publish or perish syndrome -- part is due to a strong push by AIA research funding.

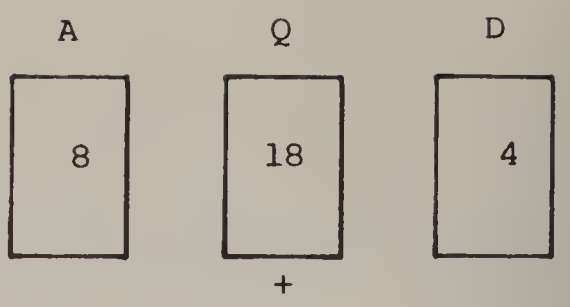
-OK -- but reason is that most architects are small business. They do not have resources for supportive investigative efforts unless the client will pay.

-Much research is done in isolation and not very available to the building public. Libraries are lacking in resources.

-The dissemination of building research information is completely fractionalized. In libraries, only part of the information can be found. There should be a central clearinghouse for all research for
.proposals (approved for funding or not)
.projects being worked on presently
.finished research

-I find that it varies with the experience of the researcher. The old hands know what has gone before. The aspiring researcher does not.

11. Researchers don't trust architectural journals because there are no adequate referee journals in architecture. There is no knowledge in American architectural journals.



SELECTED RESPONSES

-Yea, and amen!

-YES!!! Say it loud!

-You cannot quarrel with taste.

-Very true except for some fine foreign journals OAP, A.R.T. (England) A.S. Review (Austrialia). /1/

-Architectural journals are not directed to researchers. They transfer the taboos and value systems for building design -- not research.

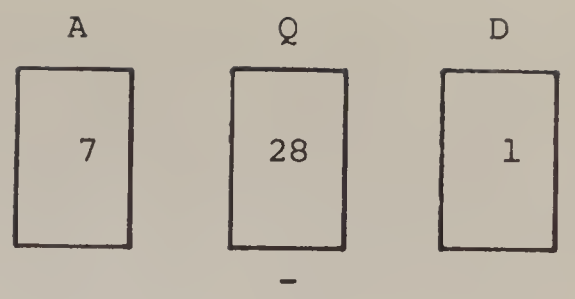
-The only publication which has relevance for researchers is "Industrialization Forum", and reports from conferences.

-You downgrade the AIA Journal, Record, PA, etc. They can be trusted to a greater extent than our normal Press.

-Architectural publications who depend on product advertising for revenue are not able to publish critical comment or feedback from architecture on performance. Alternative is needed.

/1/ I would also include "Architectural Review" (England).(ed.)

12. Problem of publishing in a trade journal is that even though one gets a lot of enquiries, the researcher will not learn anything about the worth of his research -- that is, there will be no discussion. On the other hand, if published in a professional journal it will never be utilized, but it will generate considerable discussion among peers.



SELECTED RESPONSES

-Why can't the author publish two papers on the same subject but written for different audiences?

-Why should this be a block to publishing? Use both. Sounds like an excuse, not a reason.

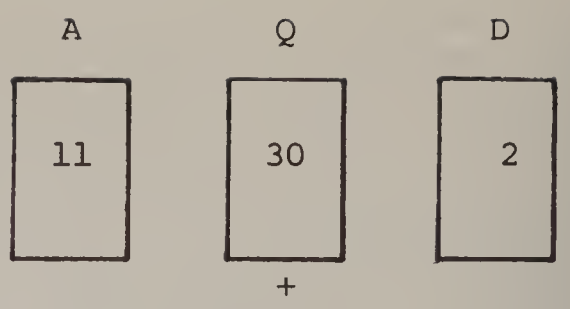
-Engineers need to be more aware of trade journals however -- no credit in academic circles is part of the problem.

-Much too general. I believe Trade journal information is good. It generates ideas. Professional papers are quite different in content and objectives. Both have their special place. Many innovations come from data presented in professional journals.

-Agree in part. However, this is very dependent on how we use professional channels. It is extremely important to get peer evaluation.

-This surely is a recommendation for broad spectrum publishing if this interest is both academic and applied. For example, the publication policy Division of Building Research, National Research Council, Ottawa, Canada.

13. Problem with directories of research projects (and information clearinghouses) is that researchers are bombarded with requests for their reports, and not very intelligent requests.



SELECTED RESPONSES

-While there may be a problem, one cannot expect everyone to be knowledgeable on every subject. If they were, they would not be asking for information. The education of those who "need to know" is a major function of such institutions.

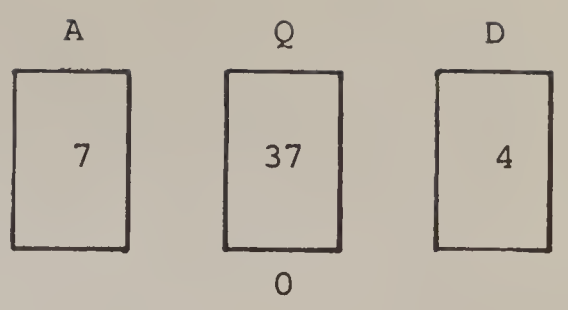
-May be true but if some of the requests are intelligent, the total exercise may be worthwhile.

-Disagree on bombardment. Agree on intellectual level of requests.

-Why are architects unique? This is not a problem for other scientific types.

-In view of the state of information retrieval in construction industry, this is not surprising.

14. Face-to-face contact is the number one method of communicating with one's peers. Any writing that is done is done for other than peers.



SELECTED RESPONSES

-It is a sad commentary on today's civilization if we no longer can write or will read. Face-to-face is the basic method at the working level, but the written word is the record that survives. The statement is absurd, but the proliferation of airport fly-in meetings shows that someone believes it.

-So what. Both methods are very important -- writing commits one to a course of action which researchers are often unwilling to do.

-True. However, the "other than peers" often cannot understand what is meant by what is written. What is written is usually in "peer" language.

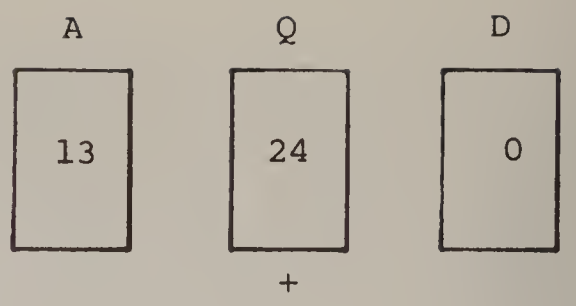
-But our peers are becoming too numerous for face to face communication. The good report has a better chance of transferring necessary details to more people.

-"Face-to-face contact is the number one method of communicating with one's peers and for others than peers."

-This is true, but most designers of information systems refuse to accept this fact.

-This varies with the work situation and expectations of the individual. Problem solvers (architects, engineers, planners) will use face-to-face as the principal information seeking mode. Research works will complement this with a lot of reading (journal, reports, etc.) plus a lot of attendance at conferences.

15. Information systems are designed to serve some unique purpose and population. So it is not exactly re-inventing the wheel to develop one's own information system.



SELECTED RESPONSES

-Yes, but I have seen no good information systems in the USA.

-True, but there has to be an economic balance achieved in relation to the coverage of each system and its users.

-A well designed system should be able to look like a customized data base for many disciplines and thus produce useful results for many.

-For the most part I disagree with this statement. There are many elements common to most information systems and many user populations have similar needs and problems in terms of retrieving information.

-Agree, but stress that other systems should be examined and it should be determined how your particular knowledge base and user audience needs will differ from other systems...

-True. The file drawers in your office are your own information system. Same is true with the bits of paper you have hanging on your wall, tack board, etc.

16. "Research results can lose something in the translation." The researcher's interpretation of the research program may differ from that of the user of the results. The researcher may present results in a form unfamiliar to the user.

A	Q	D
18	26	1
	+	

SELECTED RESPONSES

-True, unfortunately. Reason is that the research worker is asking the question "WHY" whereas the user is asking the question, "What should I do?" Thus orientations and presentation of results differ.

-They better get together and solve the communication problem also for feedback. Part of a good research result is its good communicable presentation.

-And the researcher may not have been given the proper explanation of the market use.

-There is always this danger but it stems primarily from the fact that most research reports are written for other researchers to read.

-Need more joint conferences for understanding.

-Right -- writing to be well understood is a real challenge and the British do it better than we do.

-Very true...Most of us never were subjected to research methods and required to use such in the design of buildings. They why should we know? This again reverts to the schools and methods of teaching.

-Researchers, like many others, are not always good communicators. May be need for a communications intermediary.

17. We need "service-oriented researchers", that is, those who actually perform a service to practitioners. These are synthesizers of research, or linkers who can get the results from the researcher and take them to the user. Lack of synthesizers or linkers is a barrier to implementation of innovation.

A	Q	D
22	26	0
	+	

SELECTED RESPONSES

-This surely is the "D" in "R&D". The "R" component is frequently an individual effort and it is a frequent misconception that the "D" component is also an individual activity. Philosophically, it is an entirely different activity more suited to groups or teams. I would say we need more groups engaged in Applied Building Research, Building engineering, and related Education.

-This I can support only in defining such a "researcher" as a "developer", who must understand the research results very well. On the other hand, this may perpetuate the problem of researchers ivory tower (being removed from reality of application). In building especially, having to do so much with physical things, the researcher should try to be as close as possible to application (feedback).

-Correct. If anything has failed in the US, it has been a decline in people with this talent. I believe our education system has failed in this regard. Our education is too theoretical.

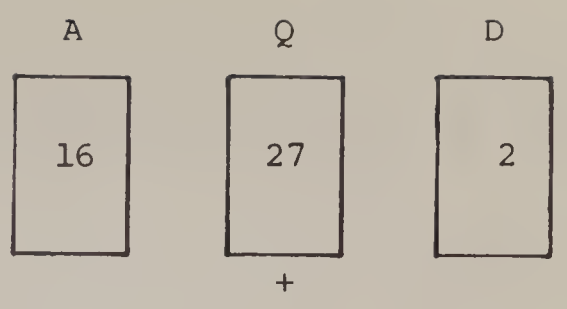
-Agree. Another way of expressing this is to say we need applied, as well as pure, research. Still need good communications as in 16 above.

-There is a real need here. Some research needs to be translated from its original perch to the new ground where it can be used in modified form.

-Maybe the problem is lack of knowledge on the part of the user, so education, not just information, needed.

-Large firms have the capacity to have these kinds around. Small firms do not. We in this nation are primarily small architectural firms and operators.

18. One barrier to implementation of innovation is the lack of motivation of people to do something that has not been done before.



SELECTED RESPONSES

-They will if they see a profit.

-Sure! And that will always be the case. The problem is to establish enough incentive for implementation economically.

-One has to demonstrate that an innovation will have value. Then motivation will come.

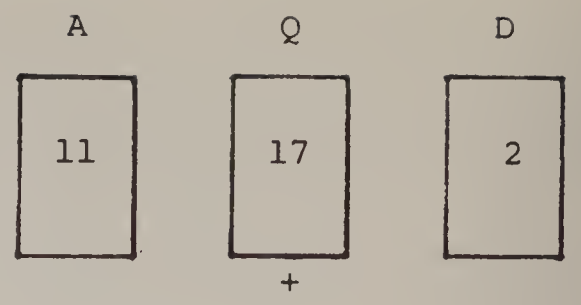
-What is the reward system in the mind of the architect?

-True. Also recognize that few people are given the specific task of using new knowledge with the understanding that a failure is still OK.

-Innovation is predicated on past knowledge. I don't think we lack motivation, but lack of methodology and orientation.

-Not true. Search for novelty is ceaseless.

19. Another barrier to implementation of innovation is the lack of continuity in leadership in change and innovation.



SELECTED RESPONSES

-Very true at national funding level for research.

-Management leadership not so important as innovative spirit of the entrepreneur.

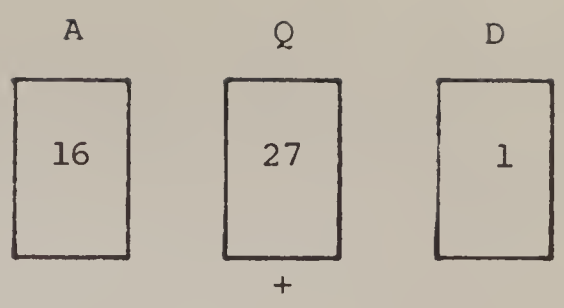
-My question: Who should provide this leadership?

-Continuity can be positive or negative in effect. There should be some room for randomness.

-True, every new idea starts with its hero!

-That is a fact, related to the quality of mankind!

20. There is a general lack of feedback when research results are utilized, so it is difficult to know how useful the research has been, or to see how future projects can benefit.



SELECTED RESPONSES

-We in applied research find this to be true, and I'm sure those in pure research find it even more so.

-Lots of opinions, usually expressed orally, but not much good documentation.

-Evaluation should be part of a researcher's total job.

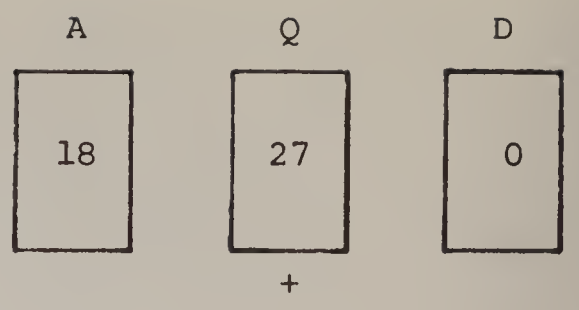
-True. But it is the researcher's responsibility to follow up -- many of them shirk this.

-True. Very poor follow-up generally due to lack of funding for this most important phase.

-True. Research results, like every thing else, have to face the cost/benefit test. This cannot be done without feedback.

-There should be no funds for utilization of research results unless feedback and evaluation are part of the program.

21. We cannot discover voids in research by just looking at what has already been done. We need to inquire about what people need to know.



SELECTED RESPONSES

-Very true. Research must, at times, be "demand oriented".

-Problems stimulate solutions but solutions seldom stimulate problems.

-Agree, but only in part. Some glaring errors can be very instructive.

-OK, but how do architects know when they do not know something?

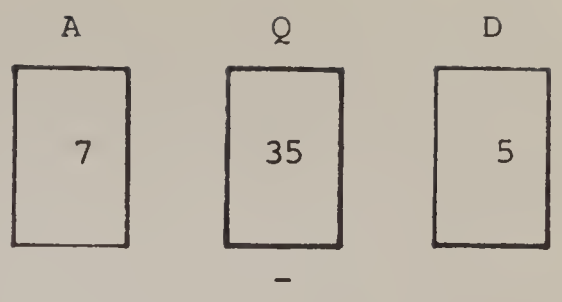
-Good research work requires knowledge of past efforts.

-No. Have to do both. People stating needs have a limited view (by definition).

-Good reason for industry-university-government cooperation.

-All these could be helped by a NIBS-type organization.

22. Intercommunications about research projects is good among universities; it is bad between industry and universities, and bad from industry to industry.



SELECTED RESPONSES

-I'm not even sure that it is good among universities, or even or even interdepartmentally. It is often purely a personal Odyssey.

-I wouldn't give many good marks to universities either.

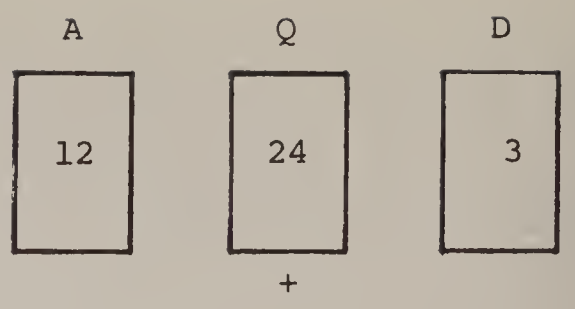
-Rather poor among universities, better between industry and university and quite reasonable from industry to industry considering the competitive nature of relationships.

-Industry to industry communication likely to be limited in their search for competitive advantage.

-Industries are overprotective of proprietary information to their own great disadvantage.

-Not very good at <u>any</u> level.

23. Much of industry--sponsored research at universities is meant to graduate people better qualified to enter and be useful to the industry.



SELECTED RESPONSES

-Correct, but not a negative input. It is vital that universities have good contact with industry and this input helps.

- Least expensive way to perform the needed research and to orient new employees into their field.

-Also, industry can obtain expert technical assistance on their problems at modest cost.

-Partly true, but the profit motive has to be in there somewhere.

-Nothing wrong with that as long as research is worth being called such.

-Disagree, in our locality there is a tendency in industry to look upon problem solving as first priority and education as a very low priority.

-Baloney. The project leaders are faculty not students. Students don't get deep enough to be useful to industry.

24. However, industry-based research is profit motivated. University-based research is for education purposes. University-based research which is sponsored by industry tends to benefit the university and the student more than it does the industry.

A	Q	D
9	29	1
	+	

SELECTED RESPONSES

-Certainly, all sponsored university research is not strictly for education purposes. If true, industry goes into the arrangement with its eyes wide open and shouldn't expect more.

-No, to the second part. If this were true, industry would not keep coming back for more. They are not charitable institutions.

-But then the student should benefit the industry!

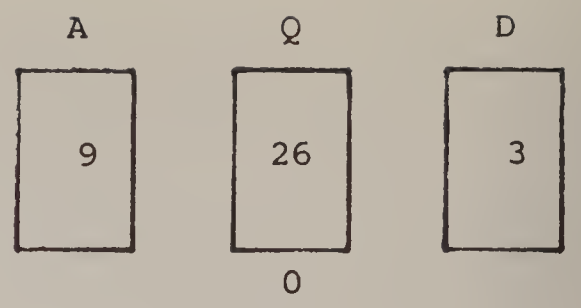
-Frequently true, but not invariably so. A university isn't particularly efficient in performing industrial research, but the results can be excellent.

-Not necessarily so...this appears to be politically, socially, and economically, a naive statement. There is evidence, however, that industry may be better off with more substantial in-service training programs and less reliance on the school systems.

-I believe this has been borne out by experience with U.S. Steel-sponsored research at universities.

-True of both industry and government-sponsored research. This is a ploy to support academia.

25. Government-sponsored research tends to be limited to one Administration, and is only funded for one year, with the second year promised.



SELECTED RESPONSES

-Yes, simply a result of the government budgetary process.

-This is true in some sectors like building. Military, space, atomic energy, agriculture, etc. have long-term programs, related to national goals, that often have better continuity.

-Certainly to one administration. In-house government-sponsored research, however, tends to grind on and on, frequently beyond a useful life.

-Not sure I understand "limited". Maybe "swayed be the interests of". Last part true, although "promise" is a strong word.

-Right and a serious problem. We need to develop research expertise in this building area and that requires continuous support for some talented people.

-Generally true, but there are very important exceptions.

-May be true sith some governments. Not so with National Research Council of Canada.

-Agree. In Canada representatives for particular areas seem to be spread among a number of administrations leaving it to others to pass the buck between these departments. This makes negotiations hair-raising at times.

PART III: Descriptions of Selected Research Sponsoring, Conducting, and Disseminating Organizations

IIIA: U.S. Government

Center for Building Technology (NBS)
Construction Engineering Research Laboratory (CERL)
Cooperative Extension Service
The Forest Service (USDA)
Government-Industry Data Exchange Program (GIDEP)
Hazan International (SSIE)
Highway Research Information Service (HRB)
National Clearinghouse for Mental Health Information (HEW)
National Science Foundation (NSF)
National Technical Information Service (DOC)
Naval Civil Engineering Laboratory (NCEL)
Naval Facilities Engineering Command
Naval Ordnance Laboratory (NOL)
Office of Research and Technology (HUD)
Pacific Northwest Forest and Range Experiment Station (USDA)
Pacific Southwest Forest and Range Experiment Station (USDA)
Science and Technology Division (LOC)
Smithsonian Science and Information Exchange (SSIE)
Technology Transfer Office (NOL)
Technology Utilization Division (SBA)

CENTER FOR BUILDING TECHNOLOGY
Institute for Applied Technology
National Bureau of Standards
U.S. Department of Commerce
Gaithersburg, Maryland
Phone: 301-921-1000

Description:

The mission of the Center for Building Technology is to provide services in building research and building technology to government and to the public within the limits of the Center's authority and its resources; those needed services being identified through national goals, and by Federal construction agencies, related agencies in State and local government, appropriate segments of the private sector, and a continuing technological awareness of the Center's professional staff.

The chief components of CBT are: Structures, Materials, and Life Safety Division; Building Environment Division; Technical Evaluation and Application Division; Office of Building Standards & Codes Services; Office of Housing Technology; and Office of Federal Building Technology.

Information Generating and/or Disseminating Mechanisms:

Operates: -Conferences, Workshops, Seminars, etc.

Publishes: -Reports of its research. These reports are published as National Bureau of Standards Publications and National Bureau of Standards Interagency Reports (NBSIRs). The NBS publications are available either from the Superintendent of Documents, U.S. Government Printing Office, or the National Technical Information Service (NTIS). NBSIRs are generally available from NTIS only.

(CBT includes over 870 documents from 1964 to the present in its data base.)*

---

* CBT can search for information but does not distribute documents. CBT sends source and price of document.

CONSTRUCTION ENGINEERING RESEARCH LABORATORY

Department of the Army
P.O. Box 4005
Champaign, Illinois 61820
Phone: 217-352-6511

Description:

CERL was established in 1968 by the U.S. Army Corps of Engineers. Under the command of the Directorate of Military Construction the goal of CERL is to improve the functional values of military and other government facilities while reducing their cost. To accomplish this goal research is conducted in building materials, utilities, and structures. In a combined effort, the Engineering Development Division and the Laboratories Division explore the life cycle requirements of facilities -- from design through construction to replacement -- and integrate technological developments into the construction industry. In performing its research mission CERL maintains a close relationship to the academic, engineering and construction agencies of the U.S. Army Corps of Engineers.

Affiliated with the nearby University of Illinois, CERL participates in a number of cooperative programs which significantly strengthen its capabilities and broadens its perspective.

Information Generating and/or Disseminating Mechanisms:

Operates:

Publishes: -Research reports which are available through the National Technical Information Service and the Government Printing Office.

COOPERATIVE EXTENSION SERVICE *
Forestry Service Extension Program
Colorado State University
Fort Collins, Colorado
Phone: 303-491-6281
Contact: Lowell H. Watts, Director

Description:

The Cooperative Extension service is that organizational entity of the Department of Agriculture and the land-grant system created under provisions of the Smith-Lever Act and subsequent related legislation which conducts educational programs of an informal, non-resident, problem oriented nature. Although the basic legislation does not require financial matching of federal funds except on a state basis, local units of government have seen fit to participate to a considerable degree.

It is educational in program content and methodology, not regulatory or financial; thus, is administratively attached directly to the public university system and is a major part of it, rather than being attached directly to state government.

It provides informal, noncredit education conducted primarily beyond the formal classroom, and for all ages.

In its educational role, it interprets, disseminates, and encourages practical use of knowledge. It transmits information from researchers to the people.

Cooperative Extension has long concentrated upon the development of personal leadership. It is increasingly involved in community-wide problems such as land use, planning, zoning, and environmental problems.

Information Generating and/or Disseminating Mechanisms:

* Read: Watts, L.H., ed. coord. A People and a Spirit, a Report of the Joint USDA-NASULGC Extension Study Committee. Fort Collins: Colorado State University, Printing and Publications Service, November 1968.

THE FOREST SERVICE
U.S. Department of Agriculture
Washington, D.C.

Description:

...Conducts forest and range research at more than 75 locations from Puerto Rico to Alaska and Hawaii.
...Participates with all State forestry agencies in cooperative programs to protect and improve the Nation's 395 million acres of State, local and private forest lands.
...Manages and protects the 187-million-acre National Forest System for sustained yield of its many products and services.

Information Generating and/or Disseminating Mechanisms:

Operates: -Eight Forest and Range Experiment Stations, located in Upper Darby (Penna.), Ashville (N.C.), St. Paul (Minn.), New Orleans (La.), Fort Collins (Colo.), Ogden (Utah), Portland (Ore.), and Berkeley (Cal.). The FRES's represent the Research Branch of the Forest Service; each deals primarily with problems within its regional jurisdiction. (Two stations are described further, below.)

-The Forest Products Laboratory in Madison, Wisconsin.

-Cooperative Programs: Through the McIntire-Stennis Cooperative Forestry Research Program (P.L. 87-788), the Forest Service provides funds for cooperative forestry research at some 60 universities in all 50 states and in Puerto Rico. In a given year, the program might involve several hundred scientists and graduate students working on 400 to 500 projects.

-In cooperation with state agencies, universities, industry, and conservation organizations, the Forest Service sponsors, cosponsors, or participates in seminars, workshops, symposiums, and meetings throughout the country. A recent "in-Service" meeting is worth noting. In January 1973, representatives of the three branches of the Forest Service -- National Forests, Research, and State & Private Forestry -- conducted a Research Implementation Workshop in Atlanta, Ga., to discuss "The Roles of the Forest Service in Research Implementation."

GOVERNMENT-INDUSTRY DATA EXCHANGE PROGRAM (GIDEP)
Officer in Charge (Code 862)
Fleet Missile Systems Analysis and Evaluation Group Annex
Naval Weapons Station
Corona, California 91720
Phone: 714-736-4677 Autovon: 933-4677

Description:

GIDEP is a cooperative actively between Government agencies and industry participants. GIDEP provides both the government agencies and the contractors with automatic interchange of technical data related to parts, components, and materials utilized in military and space systems.

The GIDEP originated as the Interservice Data Exchange Program (IDEP), wherein the Army, Navy, and Air Force ballistic missile agencies combined their efforts to eliminate duplication of testing efforts, an urgent problem that concerned all three.

The government agencies participating in the program are the Army, Navy, Air Force, National Aeronautics and Space Administration (NASA), Department of Transportation (FAA), and the Canadian Military Electronics Standards Agency (CAMESA). The Navy Department administers the program for the participating government agencies. At present there are over 300 contractor, Government agency, and instrument manufacturer participants generating technical documentation for inclusion in the program.

The technical data bank includes information on parts of components, materials, manufacturing processes, calibration procedures, and related technical test data. GIDEP also provides general technical reports and documents of particular significance to parts application, contractor-generated reliability specifications, in-process parts testing activity, and related documents.

Information Generating and/or Disseminating Mechanisms:

Operates: -The GIDEP provides a data bank to participants in microfilm cartridges. A rapid-access retrieval system for locating data is provided to each participant to effect a single information source to satisfy all participant needs. GIDEP assures that previous experience is utilized and that costs to the government are not repeated to generate the same experience. In addition, GIDEP operates on a voluntary data exchange basis with participant contractors and instrument manufacturers contributing generated data. GIDEP utilizes a Univac-1108 computer with on-line remote terminals for data search and retrieval.

Publishes: -"Engineering Data Interchange," a semi-annual Report Index.
-Metrology Data Interchange Indexes
-"Alerts", identifying potential problems on parts and materials
-Urgent Data Requests (UDRs), to obtain specialized data
-Failure Rate Data Summary listings

HAZAN INTERNATIONAL
38, rue de Moscou
Paris 8e, France
Phone: 878.78.13

Description:

HI is a European representative of the Smithsonian Science Information Exchange. More than a clearinghouse of on-going research projects, HI is a consulting organization which detects future growth opportunities and means of exploiting them. The firm acts as a communications link between research and industry, and actively promotes R&D leading to new products and techniques to meet market demands.

Information Generating and/or Disseminating Mechanisms:

Publishes: -"International Business Proposals", five times a year in French and English. Includes business proposals, both "looking for" and "to offer", for new products, investments or venture capital, and joint ventures; services offered by research centers; and studies available.

HIGHWAY RESEARCH INFORMATION SERVICE (HRIS)
Highway Research Board
2101 Constitution Avenue, N.W.
Washington, D.C. 20418
Phone: 202-961-1782

Description:

HRIS is an automated information storage and retrieval system developed by the Highway Research Board with financial support from the State Highway and Transportation Departments, the Federal Highway Administration and the Urban Mass Transportation Administration of the U.S. Department of Transportation. This service permits transportation administrators, engineers, and researchers rapid access to information about highway-related research and the results of completed research throughout the world.

Extensive coverage of transit research information is maintained as an integral part of HRIS.

With over 57,000 references now stored on computer tapes and with the addition of 10,000 new items annually, HRIS is one of the most complete collections of information on ground transportation research available anywhere.

Information Generating and/or Disseminating Mechanisms:

Operates: -File searches, on a fee basis.

-Current Awareness printouts, whereby HRIS can provide monthly selections from its input, based on the specific needs of individuals or organizations.

Publishes: -"HRIS Abstracts", quarterly.

-"Highway Research in Progress", annual issue.

NATIONAL CLEARINGHOUSE FOR MENTAL HEALTH INFORMATION (NCMHI)
U.S. Department of Health, Education, and Welfare (DHEW)
Office of Program Planning and Evaluation
National Institute of Mental Health
5600 Fishers Lane
Rockville, Maryland 20852
Phone: 301-443-4517

Description:

The Clearinghouse is responsible for the National Institute of Mental Health's program of scientific and technical information. To fulfill this responsibility, its major functions are to acquire, on a world-wide basis, all salient information on mental illness and mental health; process this information for input in accordance with the latest computer technology; synthesize and stimulate analysis of materials in the information base; repackage the information for dissemination through periodical and special publications and in response to inquiries from the scientific and professional community and the concerned public. The Clearinghouse is a central information resource to which anyone working in the mental health field, both inside and outside the Institute, may turn for information services.

Information Generating and/or Disseminating Mechanisms:

Operates: -"Technical Information Section", which conducts computer searches in response to individual requests. Output is in the form of a computer printout of literature citations and abstracts, publications, and/or referrals to organizations or individuals that can give more complete information pertinent to the request.

Publishes: -"Psychopharmacology Abstracts", bimonthly with Vol. 11.

NATIONAL SCIENCE FOUNDATION
1800 G Street, N.W.
Washington, D.C. 20550
Phone: 202-655-4000

Description:

NSF was established by the National Science Foundation Act of 1950, and was given additional authority by the National Defense Education Act of 1958, as amended through August 14, 1969.

The fundamental purpose of NSF is to strengthen research and education in the sciences in the United States.*

Sponsoring Mechanisms:

The National Science Foundation Act of 1950, as amended, authorizes the Foundation to initiate and support scientific research and programs to strengthen scientific research potential.

The Foundation also supports many other scientific objectives by support of: construction and modernization of major research facilities; computing activities; scientific education projects, such as institutes, fellowships, and course-content improvement programs; special international cooperative programs in science; and the National Sea Grant Program.

Several Research Divisions exist within NSF to administer grants. These Divisions provide comprehensive support to research in engineering and all the sciences. Major mechanisms through which research is supported include project grants to scientists, primarily at universities and colleges and cooperative national research programs of a specialized nature. Organized area research in subjects such as optical communications, wind engineering, ship traffic control, planning and design of tall buildings, etc., is supported by the research divisions. In addition the Foundation assists in the procurement of specialized research facilities and equipment.

---

* For descriptions of other Federal agencies, see: U.S. Office of the Federal Register. United States Government Organization Manual. Washington, D.C.: U.S.G.P.O. This is the official handbook of the Federal Government, revised annually. It contains descriptions of the agencies of the legislative, judicial, and executive branches, including brief descriptions of certain boards, commissions, and committees. The Manual contains brief statements on the quasi-official agencies and of selected international organizations.

In addition, two other research related programs are in effect: Research Applied to National Needs (RANN), and the Experiment R&D Incentives Program.

-RANN is specifically problem-oriented. It consists of an array of specific programs focused on objectives related to particular national needs.

Activities supported by RANN will seek to increase understanding of social and environmental problems and their underlying causes, and to identify opportunities and means for applying advanced technology for the benefit of society.

-The Experimental R&D Incentives Program was initiated by NSF in 1972 to provide experimental evicence concerning various incentives which the Federal Government might use to increase the application and use of science and technology in the civil sector.* The assignment to NSF is to determine, by experiment, the actual effects of various incentive mechanisms for increasing the rate of transfer of new technology to goods and services manufactured and consumed in the private and public sectors.

In organizing and supporting an experimental program in innovation incentives, the National Science Foundation is interested in identifying and testing incentives which would: (1) promote the increased utilization of new technology by all sectors of the economy, and (2) in the long run, stimulate greater non-Federal investment in R&D.

---

* The Experimental R&D Incentives Program of NSF is being planned and carried out in cooperation with the Commerce Department's similar Experimental Technology Incentives Program.

NATIONAL TECHNICAL INFORMATION SERVICE (NTIS)
U.S. Department of Commerce
Springfield, Virginia 22151
Phone: 703-321-8000

Description:

The Commerce Department's National Technical Information Service (formerly the Clearinghouse for Federal Scientific and Technical Information) is the central source for the public sale of Government-sponsored research and development reports, and other Government analyses prepared by Federal agencies, their contractors or grantees.

Information Generating and/or Disseminating Mechanisms:

Operates: -"NTISearch", which provides comprehensive access by subject to the total NTIS data base. Searches are based on key words (descriptions) assigned to all data entering the system. Output is available on paper copy, microfilm, microfiche or microforms.

Keywords are found in the "Thesaurus of Engineering and Scientific Terms", prepared for the U.S. Department of Defense by the Office of Naval Research, Project LEX, in joint operation with the Engineers Joint Council, 1967. Note that the "COSATI Subject Category List" adopted for the Federal Government, was followed as far as was logically feasible in assigning descriptions to the List's broad subject fields and groups.

Publishes: -"Weekly Government Abstracts", begun in 1972, to eventually replace the semi-monthly "Government Reports Topical Announcements". Among the titles originally converted from the GRTA series, and available for annual subscription is "Building Technology" (a new category). Relevant documents which are directed to NTIS are abstracted in this WGA.

-"Government Reports Announcements", semi-monthly. GRA includes business and economic data as well as scientific and technical report literature. It announces information released to the public through NTIS by U.S. Government Departments and Agencies, which includes reports of completed, Federal government sponsored research.*

-"Government Reports Index", semi-monthly. All reports announced in the concurrent Graduate Reports Announcements are indexed in GRI.*

(*) over

* NTIS pricing information: Reports in the NTIS collection are available indefinitely. Current prices are shown in the document entry price code. Document prices are subject to change without notice. For reports carrying the notation "NOT AVAILABLE NTIS", consult the report citation in the journal for availability information. Those with the notation, "REPRINT" are available from the source journal or from NTIS in paper copy at $3.00, microfiche 95 cents.

NAVAL CIVIL ENGINEERING LABORATORY (NCEL)
Port Hueneme, California 93043
Phone: 805-982-4528 (Autovon 360-4528)
Contact: Captain E.M. Saunders

Description:

NCEL is a research, development, test and evaluation facility under the Director of Naval Laboratories. The Laboratory is operating on an annual budget of about $14 million.*

Information Generating and/or Disseminating Mechanisms:

Operates: -Facilities Engineering Support Office (FESO), to determine and implement ways in which NCEL can provide better service to the public works personnel who are directly involved in constructing, operating and maintaining facilities at field activities throughout the shore establishment. It performs short-term services, upon request and without cost to determine the relative value and suitability of: new materials, equipments, processes, construction or maintenance procedures. FESO provides a point of contact for liaison with field; coordinates RDT&E assistance projects; identifies user needs and influences R&D program; and insures application of results.

Contact: Mr. Eugene Early (805-982-4070) (Autovon 360-4070)

Publishes: -"RAP Briefs" (NCEL Research Applied to Public Works) Distribution limited to U.S. Government agencies. Provides information on selected portions of the work currently underway at NCEL that may be interesting and useful to engineers throughout the shore establishment.

-Technical Reports

---

* In order to determine the usefulness and enhance the research and development output utilization efficiencies, particularly as related to the Naval Civil Engineering Corps, a study was commissioned at the Naval Postgraduate School, Monterey California. The report was released in 1972. Creighton, J.W., Jolly, J.A., Denning, S.A. Enhancement of Research and Development Output Utilization Efficiencies: Linker Concept Methodology in the Technology Transfer Process. Monterey: Naval Postgraduate School, June 1972.

-Technical Notes

-NCEL Techdata Sheets

-Guide to Technical Documents, annually. An index to the technical documents which report the solution of NCEL scientists and engineers to problems confronting the engineering office.

-NCEL Abstracts of Technical Documents, quarterly. These abstracts of NCEL technical documents are from reports issued during a three month period. They cover a wide range of investigative effort on the part of the only Laboratory directly serving the Naval Shore Establishment. The value of this work lies in the use made of reported results to solve current problems plus the development of technology with which to deal with problems of the future.

The NCEL Abstracts are published to improve the timeliness of reporting of results of work undertaken by the Naval Civil Engineering Laboratory to engineers of the Naval Shore Establishment and other interested Government agencies. NCEL Abstracts will be published quarterly to update the NCEL Guide to Technical Documents.

-Assorted, unclassified, unlimited documents are available to the general public from NTIS:

NTIS - National Technical Information Service
Operations Division
5285 Port Royal Road
Springfield, VA 22151

-"News About Navy Research in Environmental Protection", a collection of newspaper clippings from 1970 and 1971, describing environmental protection research activity.

NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)
Department of the Navy
200 Stovall Street
Alexandria, Virginia 22332
Phone: 202-325-8535

Description:

NAVFAC, under the Naval Material Command, has the basic responsibility for shore and seafloor facilities R&D for the Navy. This includes all technologies and disciplines inherent in the building, construction, environmental, or civil engineer related industries as well as some ocean engineering. NAVFAC is the largest single sponsor of research at its Naval Civil Engineering Laboratory (NCEL) in Port Hueneme, California.*

* NCEL is described in detail under Research Centers.

NAVAL ORDNANCE LABORATORY
White Oak
Silver Springs, Maryland 02910

Description:

NOL is a Department of Defense Laboratory and R&D center for the Navy. NOL technology currently spans the following spectrum of activities: basic and applied research; exploratory, advanced, and engineering development; test; evaluation; pre-production design and engineering; system integration; and fleet engineering support.

Information Generating and/or Disseminating Mechanisms:

Operates: -Technology Transfer Office, established in February 1971 to provide a focus for all technology transfer at NOL. (Further description below.)

OFFICE OF POLICY DEVELOPMENT AND RESEARCH
U.S. Department of Housing and Urban Development
451 7th Street, S.W.
Washington, D.C. 20410
Phone: 202-755-5600

Description:

The Office of Policy Development and Research is the research office of HUD, established to conduct research including experiments, pilot testing and demonstrations to provide better understanding of national problems in housing, community development and urban growth. Research results are used to encourage change -- innovation, improvement, modernization -- in the entire gamut of housing and community development, planning and management activities.

Sponsoring Mechanisms:

Title V of the Housing and Urban Development Act of 1970 authorized such sums as may be necessary for undertaking programs of research, studies, testing, and demonstrations relating to the mission and programs of the Department. This legislation places under one broad authority all research activity of the Department, including authorities contained in the Housing Acts of 1948 and 1956, the Demonstration Cities and Metropolitan Development Act of 1966, and other Housing and Urban Development legislation.

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
Portland, Oregon

Description:

PNW, headquartered in Portland, represents the research branch of the Forest Service in Alaska, Oregon and Washington. The Station's research program is carried out in seven locations: Fairbanks, Seattle, Olympia, Wenatchee, Corrallis, LaGrande, and Bend.

Information Generating and/or Disseminating Mechanisms:

Publishes: -periodically, a "USDA Forest Service RESEARCH NOTE", abstracting and reporting on a complete research project.

PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION
1960 Addison Street
P.O. Box 245
Berkeley, California 97401
Phone: 415-841-5121

Description:

PSW, headquartered in Berkeley, represents the research branch of the Forest Service in California and Hawaii. The Station's research program is carried out in six locations: Berkeley, Arcata, Redding, Fresno, Riverside, and Honolulu. Although emphasis is given to problems in these two States, some research units have assignments with broad regional responsibilities. In addition, PSW provides technical and administrative support to study teams working on problems specific to the National Forest System.

Information Generating and/or Disseminating Mechanisms:

Operates: -Calfornet, "California Forest Research Information Network": a technical information service sponsored by the USDA-Forest Service; the School of Forestry and Conservation, University of California; and the California State Library, with the cooperation of local county and public libraries.

-Science Literature Service, Monthly Announcement List, by Species Index, Subject Index, Classification List (Oxford System)

Publishes: -Each year, the Station publishes from 100 to 125 technical and scientific articles relating to forestry research on timber management, range, watershed, wildlife, and recreation. The information is published as Station Research Notes, Research Papers, or in a variety of technical and professional journals. Availability of these publications is announced in quarterly and annual lists issued to a mailing list of some 3,000 subscribers.

-The Station also publishes "What's New in Research" and periodic bulletins, brochures, and articles of interest to the general public.

SCIENCE AND TECHNOLOGY DIVISION
Library of Congress
10 First Street, S.E.
Washington, D.C. 20540
Phone: 202-426-5000 (Library of Congress switchboard)

Description:

The Science and Technology Division has primary responsibility within the Library of Congress for recommending acquisitions and for providing reference, bibliographic, and referral services in the broad areas of science and technology. With the exception of technical agriculture and clinical medicine, which are subject specialties of the National Agricultural Library and the National Library of Medicine, the Library attempts to collect definitively in all aspects of science and technology.

Information Generating and/or Disseminating Mechanisms:

Operates: -a conventional library reference service based on the 3 million books, 1.3 million technical reports, and 36,000 journals that make up the Library's holdings in science and technology.

-a "National Referral Center", which provides referral service free of charge to anyone working in any field of the physical, biological, social, or engineering sciences. The Center's constantly updated information resources data base enables it to direct those who have a question concerning a particular subject to organizations or individuals with specialized knowledge of that subject. It directs inquirers not to literature, but to people, by providing names, addresses, telephone numbers, and statements regarding any special conditions of service imposed by the information sources. Its aim is to establish the most direct contact possible between the person seeking the information and the people who can provide it.

Publishes: -a series of guides under the general title "A Directory of Information Resources in the United States". They include Social Sciences (1973), Biological Sciences (1972), Physical Sciences, Engineering (1971), General Toxicology (1969), Federal Government (1967-Revision 1973), and Water (1966).

SMITHSONIAN SCIENCE INFORMATION EXCHANGE, INC. (SSIE)
1730 M Street, N.W.
Washington, D.C. 20036
Phone: 202-381-5511

Description:

SSIE is a clearinghouse of on-going research projects. 85,000 to 100,000 single page records of research projects currently in progress are collected. The projects are funded by both public and private sources of support. Each record describes WHO supports the project, WHO does it, WHERE and WHEN the research is performed, and includes a technical summary of the project.

The collection covers basic and applied research in life, physical, social, behavioral and engineering sciences.

Information Generating and/or Disseminating Mechanisms:

Operates: -Subject searches of its data base, on a service fee basis.

Publishes: -"SSIE Science Newsletter", ten issues per year. Includes subject areas, number of projects in that area, and cost for printout on those projects.

TECHNOLOGY TRANSFER OFFICE
Naval Ordnance Laboratory
White Oak
Silver Springs, Maryland 20910
Phone: 301-495-7624 (Autovon 233-7624)
Contact: Dr. Sherman Gee (Code 124)

Description:

Technology Transfer at the Naval Ordnance Laboratory is the process by which existing NOL technological resources, generated from past DOD research and development programs, are adapted to meet urgent civil needs such as in the fields of environmental pollution, law enforcement, transportation, housing, and health. The extensive technology base at NOL is being made available to government civil agencies in order that timely responses and solutions to current comestic problems can be achieved. The prompt availability of NOL technology for satisfying civil requirements furthermore avoids the need for, and the unnecessary costs associated with, the development of similar technology in the civilian establishments. Consequently, NOL has endorsed and enthusiastically encouraged the transfer of technology to non-defense pursuits.

Thus the primary objective of technology transfer activities at NOL is to provide technological assistance to civil agencies outside the Department of Defense on currently outstanding problems of national significance.

Information Generating and/or Disseminating Mechanisms:

Publishes: -Transfer Technology bulletins

TECHNOLOGY UTILIZATION DIVISION
Small Businesses Administration
1441 L Street, N.W. - Room 608
Washington, D.C. 20416
Phone: 202-382-6333
Contact: Forrest Decker, TUD Director

Description:

SBA's responsibility is "to assist small business concerns to obtain the benefits of research and development performed under Government contracts or at Government expense; and to provide technical assistance to small business concerns."

In 1967, a Technology Utilization Program was implemented to bring more of the benefits of the Government's R&D programs to small businesses. (1) The TU Division's task is to prepare and disseminate technical publications which present profitable new aerospace technology with potential industrial applications. Each publication is mailed to approximately 35,000 small manufacturers, R&D firms and testing laboratories. A Reader Service Card is provided which offers an opportunity to request technical support packages for the technical abstracts depicted. Also, requests can be made to SBA for technical assistance in solving production and pollution problems.

Note the emphasis on aerospace technology. NASA cooperates with SBA in the TU Program by providing much of the data base.

Information Generating and/or Disseminating Mechanisms:

Publishes: -"Current Index of Technical Briefs", monthly, as a joint NASA/SBA effort. Provides brief abstracts of reports on particular products, as well as reader service cards.

PART III: Descriptions of Selected Research Sponsoring, Conducting, and disseminating Organizations

IIIB: Quasi-Government

Building Research Information Correlation Service (BRICS)
National Institute of Building Sciences (NIBS)
NASA Regional Dissemination Centers
Western Research Application Center (WESRAC)
U.S. National Committee for the Internation Council for Building Research Studies and Documentation (USNC/CIB)

BUILDING RESEARCH INFORMATION CORRELATION SERVICE (BRICS)

Description:

As a part of its activity, the U.S. National Committee for CIB* (USNCCIB) makes an effort to bring research information from CIB (based in Rotterdam) to the attention of individuals and organizations within the United States. During this process, experience with the existing informal information exchange system indicates that, in its present form, it is not efficiently channeling information from the U.S. based research community to the practitioner community, nor is it capable of taking on the added burden of foreign exchange.

However, establishing a single national organization for the collection and dissemination of information relevant to the construction industry does not appear to be an appropriate solution; rather, the philosophy behind the proposed BRICS is to make the existing system work better.

USNCCIB is seeking funding support from interested federal agencies and other sources in order to initiate BRICS. Such a program would be expected to become self-supporting.

---

* USNCCIB is described separately.

NATIONAL INSTITUTE OF BUILDING SCIENCES,
alternately called National Institute for Building Standards

Description:

U.S. Senator Jacob Javits (R, NY) and U.S. Congressman William Moorhead (D, Pa) first introduced bills in the Senate and House of Representatives respectively, in 1969, to establish a non-profit instrument to be known as the National Institute of Building Sciences (NIBS). This would provide a more effective approach to the problem of developing and maintaining a rational relationship between building codes and related regulatory requirements and building technology in the United States, and to facilitate urgently needed cost-saving innovations in the building industry, through the establishment of an appropriate non-governmental instrument which can make definitive technical findings, insure that the findings are made available to all sectors of the economy, public and private, and provide an effective method for encouraging and facilitating Federal, State, and local acceptance and use of such findings.

The Housing Committees in both houses reported it out for inclusion in the Omnibus Housing Bill of 1972. The title was modified to National Institute of Building Standards. NIBS would be an independent instrument to develop performance criteria for construction material and techniques.

The Senate passed the Senate version of the 1972 housing bill. However, the House Rules Committee did not allow the house bill on to the floor for discussion because it felt many sections were controversial and needed to be resolved. Note that the section referring to NIBS was not considered controversial.

At this writing, both Senator Javits and Congressman Moorhead are going to introduce new legislation for establishing NIBS. An attempt will be made to clarify the earlier versions. (Factions exist which feel the "Standards" must be changed back to "Sciences" in NIBS, for appropriate connotation, if the Institute is to be successful.)

NASA REGIONAL DISSEMINATION CENTERS

Description:

The volume of aerospace research and development reports exceeds 600,000, with much of the information applicable to non-space endeavors. To make this information readily accessible to industry, NASA established six Regional Dissemination Centers. Each operates independently and offers a variety of services to fee-paying industrial clients. At these special facilities, reports relevant to an individual client's specific needs may be selectively retrieved.

NASA makes available to these centers computer tapes on which are indexed aerospace documents from around the world. The technical subjects in each document are indexed in depth on these computer tapes. The regional Dissemination Centers constitute a network, and supplement each other's means for keeping abreast of new technology.

The following data banks are among those available to the Regional Dissemination Centers in a form suitable for computer literature searches: NASA, Department of Defense, Engineering Index, Chemical Abstracts, Special Textile Data Banks.

The six NASA Regional Dissemination Centers are as follows:

Aerospace Research
Applications Center
Indiana Memorial Union
Bloomington, Ind. 47401
Phone: (812) 337-7970

Knowledge Availability
Systems Center
University of Pittsburgh
Pittsburgh, Pa. 15213
Phone: (412) 621-6877

The New England Research
Application Center
Mansfield Professional Park
Box U-41N, The University
of Connecticut
Storrs, Conn. 06268
Phone: (203) 429-5151

North Carolina Science and Technology
Research Center
P.O. Box 12235
Research Triangle Park, N.C. 27709
Phone: (919) 549-8291

The Technology Application Center
The University of New Mexico
Albuquerque, N.M. 87106
Phone: (505) 277-3118

Western Research Application Center
Graduate School of Business Administration
University of Southern California
809 W. 34th St.
Los Angeles, Calif. 90007
Phone: (213) 746-6133

Note that each RDC tends to specialize in an area relevant to its geographical location. Not all data bases are available at all RDC's; however one RDC can link into another's data base.

One of the RDC's is described in greater detail below.

WESTERN RESEARCH APPLICATION CENTER (WESRAC)
NASA Research Application Center
University of Southern California
809 W. 34th Street
Los Angeles, California
Phone: 213-746-6132

Description:

WESRAC is a non-profit research and technology utilization center operating within the Graduate School of Business Administration of the University of Southern California. It utilizes the resources of the National Aeronautics and Space Administration and other public and private institutions.

WESRAC's function is to assist individuals in industry and public organizations to find effective solutions to technological problems and expand their knowledge in technical areas by: (1) helping them to clarify and precisely formulate their needs; (2) conducting systematic, computer-aided searches on past and current literature -- from private and government sources and the English and foreign language press; (3) providing technical support in making effective use of the acquired information.

Information Generating and/or Disseminating Mechanisms:

As one of NASA's disseminating mechanisms, WESRAC has its methods of operating which are independent of the other RDC's.

Operates:

-"Technology Intelligence Program", a broad-scope, "customized" problem-solving and intelligence support for business, local government, and research organizations. Available on an annual retainer basis.

-"Retrospective Search Options", narrower scope assistance in solving specific technological problems.

-"Current Awareness Search Options" provides highly selective monitoring and monthly reporting of developments in areas of special interest to the client.

-"Computer Software Library" with over 800 pertinent software programs, developed in industry, government and academic institutions.

-"State-of-the-Art Symposia" on topics of special interest and in which noteworthy progress has been made.

Publishes:

-"Technology Intelligence", monthly. In-depth discussion of one report, with abstracts of several others which are available upon request.

U.S. NATIONAL COMMITTEE FOR THE INTERNATIONAL COUNCIL FOR BUILDING RESEARCH STUDIES AND DOCUMENTATION (USNCCIB)
2101 Constitution Avenue, N.W.
Washington, D.C. 20418
Phone: 202-961-1540
Contact: S.M. Charlesworth

Description:

As a part of its activity, the U.S. National Committee for CIB* (USNCCIB) makes an effort to bring research information from CIB (based in Rotterdam) to the attention of individuals and organizations within the United States. During this process, experience with the existing informal information exchange system indicates that, in its present form, it is not efficiently channeling information from the U.S. based research community to the practitioner community, nor is it capable of taking on the added burden of foreign exchange.

However, establishing a single national organization for the collection and dissemination of information relevant to the construction industry does not appear to be an appropriate solution; rather, the philosophy behind the proposed BRICS is to make the existing system work better.

USNCCIB is seeking funding support from interested federal agencies and other sources in order to initiate BRICS. Such a program would be expected to become self-supporting.

---

* CIB. The International Council for Building Research, Studies and Documentation (CIB) is a non-governmental organization that emphasizes an international collaborative effort to attain a greater efficiency in and effectiveness of programs of research, information exchange, and developmental work in the field of building and the environment of buildings. This effort is directed at various aspects of construction, applied sciences, the technical problems, the economic questions, and the social aspects that are involved in the ultimate realization of the total built environment.

  USNCCIB U.S. participation in CIB is through the U.S. National Committee for the CIB (USNCCIB) which operates under the aegis of the National Academy of Sciences. The primary objectives of USNCCIB are: (1) to function as a liaison between U.S. interests and the CIB and, thus, provide a mechanism through which the ready exchange of building research data generated by U.S. private and public organizations and other CIB members is encouraged, (2) to stimulate, through the establishment of counterpart commissions, the generation of research studies and information on the state-of-the-art in the field of building research and technology, and (3) to motivate organizations to take positive action in furthering building research, studies and documentation.

Information Generating and/or Disseminating Mechanisms:

Publishes: -"USNCCIB Building Research Notes", bimonthly notes on research in progress, research organizations, meetings of interest.

PART III: Descriptions of Selected Research Sponsoring, Conducting and Disseminating Organizations

IIIC: Canadian Government

Division of Building Research (NRCC)
National Research Council of Canada

Canadian Quasi-Government

Canadian Construction Information System (BEAM Program)

DIVISION OF BUILDING RESEARCH (DBR)
National Research Council of Canada
Montreal Road
Ottawa, Ontario, K1A OR6, Canada.
Telephone: 613-993-2443
Contact: Dr. Neil B. Hutcheon, Director

Description:

DBR was established by the NRCC in 1947 to provide a research service to the construction industry of Canada. It performs an information and advisory role as well as research, emphasizing the application of the results of research in practice.

In addition, DBR has the responsibility of serving as the technical research wing to Central Mortgage and Housing Corporation, and of providing the necessary secretarial and technical support services for the National Building Code and National Fire Codes of Canada.

Information Generating and/or Disseminating Mechanisms:

Operates:
-Workshops, seminars about current research and development, and particularly application, which are "packaged" and held in key cities across Canada.

-A central library.

Publishes:
-"Building Research News", quarterly.

-"Canadian Building Digest", monthly. Each Digest deals with one topic relating to one aspect of building research and is issued for the information of those who must deal with the technical and related aspects of building. The series began in 1960.

-Division of Building Research "List of Publications 1947-1971", plus supplements for later publications.

-"Selected List of Books Received by the Building Research Library", annually.

-"Recent Acquisitions of the DBR Library", periodically.

-"Periodicals Circulated to the Members of the Staff by the Building Research Library", irregularly.

-"DBR/NRCC Research Program", annually.

-Slide-cum-cassette packages depicting research and applications. These are sent out upon request.

NATIONAL RESEARCH COUNCIL OF CANADA (NRCC)
Ottawa, Ontario, K1A OR6, Canada.
Telephone: 613-993-9101 (General Inquiry).

Description:

NRCC is a scientific research agency of the federal government serving the people and government of Canada, Canadian industries, and the scientific community generally. Through activities undertaken in its own laboratories, through its Industrial Research Assistance Program (IRAP), and also through scholarships, fellowships, and grants to university researchers, the NRCC performs and supports research for the economic, social, and cultural benefits to Canadians. Another activity is the transfer of results of NRCC research and scientific information generally to industry, other government agencies, and the public sector to ensure that desirable social and economic benefits are available to Canadians.

In its capacities, NRCC is similar in some respects to the National Bureau of Standards, the National Science Foundation, the National Research Council, and the National Technical Information Service in the United States.

Sponsoring Mechanisms:

In addition to activities undertaken in its own laboratories, NRCC operates its Industrial Research Assistance Program (IRAP), and supports research through scholarships, fellowships, and grants to university researchers. Thus, NRCC performs and supports research for the economic, social, and cultural benefits to Canadians.

Information Generating and/or Disseminating Mechanisms:

Operates: -Within the NRCC are the National Research Council laboratories (NRCL) comprised of eight Divisions. The one pertinent to the URBBI study is the Division of Building Research, described in greater detail on a preceding page. In addition are several Associate Committees, two of which deal with the National Building Code and the National Fire Code.

-Technical Information Service (TIS)
100 Sussex Drive
Ottawa, Ontario, K1A OS3, Canada.
Phone: 613-992-5887

TIS, in association with the various Provincial Research Councils or Foundations in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, forms a free government service intended to provide the secondary or processing industries with up-to-date technological information on the properties and processing of materials, the efficient operation of manufacturing facilities, new industrial developments, and the results of scientific research.

TIS does not undertake scientific research nor operate research and testing laboratories or consultant services, but can readily put persons in touch with people who do.

-National Science Library (NSL)
Montreal Road
Ottawa, Ontario, K1A OR6, Canada
Phone: 613-992-9151 (General Inquiry until 1974)

NSL is the coordination center for scientific and technical information transfer in Canada. It maintains its own comprehensive collection, and provides many information services to the scientific, engineering, and industrial community, including a mechanized current awareness system known as CAN/SKI, and provides close support for NRCC's Technical Information Service.

Publishes: -"NRCL, Activities of the Laboratories", annually.

CANADIAN CONSTRUCTION INFORMATION SYSTEM (CCIS)

Canadian Construction Information Corporation
1750 Courtwood Crescent
OTTAWA, Ontario
K2C 2B5

Telephone: (613) 225-4990
Contact: Charles Laferriere, Office Manager

Description:

The Canadian Construction Information System was formulated in 1967 under the BEAM Program as an aid to the Canadian construction industry. At that time, various representatives of the construction industry, meeting with officials in the federal government, Department of Industry, identified the communication of information as a major factor in improving the construction industry's productivity and efficiency. Therefore, the establishment of a comprehensive national construction information system for Canada to collect, store and disseminate information became one of the projects under the BEAM Program.

The CCIS is now operated under the control of the Canadian Construction Information Corporation, a private, non-profit corporation, set up by the Department of Industry, Trade and Commerce for this purpose.

The first phase of CCIS is to communicate technical product information. It will also be capable of storing, retrieving and disseminating information on (a) codes and standards, (b) science and technology, and (c) commercial information at any future date.

The intent is that users of the System will have direct access to system components: thesaurus and key word vocabularies*; microfiche (product data and literature abstracts); search terminals (to a computer stored data base of product and literature search files); and printed indexes.

Phase I of CCIS will make the service available to the first 150 subscriber-users in the Toronto-Ottawa-Montreal area, followed by rapid expansion to a nation-wide system. Government support may be necessary in the early stages; however, CCIS is intended to be self-supporting eventually. Phase I is expected to get underway during 1973.

---

* Another related task of the BEAM Program was to compile the first Thesaurus of Canadian Construction industry terms. The Thesaurus is now available in both French and English, together with a glossary equating the French and English terms.

PART III: Descriptions of Selected Research Sponsoring, Conducting, and Disseminating Organizations

IIID: Universities

Center for Research on the Utilization of Scientific Knowledge (uni. Michigan)
Civil Engineering Department (Purdue Uni.)
The Construction Institute (Stanford Uni.)
The Ray W. Herrick Laboratories (Purdue Uni.)
Systems Building Center (Uni. of Toronto)

CENTER FOR RESEARCH ON THE UTILIZATION OF SCIENTIFIC KNOWLEDGE
(CRUSK)
Institute for Social Research
University of Michigan
Ann Arbor, Michigan
Phone: 313-764-2560

Description:

CRUSK is one of four centers within the Institute for Social Research. CRUSK was established in 1964 to investigate:
.processes of scientific knowledge utilization.
.the spread of new knowledge.
.ways of training practitioners to apply research findings in different fields.
.the value, ethical, and political issues in the use of scientific knowledge.
The initial stimulus for the Center was a growing awareness that research was needed on the gap that existed between what knowledge was already available and what was actually being used to meet problems in our society. Research relevant to the understanding of this gap continues within CRUSK. The work has broadened to include:
.how the definition of problems affect research efforts and knowledge utilization outcomes.
.how scientific knowledge is misused, used, and not used.

For example, CRUSK has a five-year contract with the USDA Forest Service to examine its research branch. The objective is to make FS research and information transfer more effective and efficient. The study is broken down as follows:

Year 1 - formulation: identify the FS' problem.

Year 2 - collect data to diagnose problem.

Year 3 - use data to design trial innovations, (design strategy to overcome barriers).

Year 4 - carry out and try suggested practices.

Year 5 - re-evaluate to see if the new practices are making an impact on change; and in addition, train the FS in the whole process for its self-perpetuation.

Information Generating and/or Disseminating Mechanisms:

Publishes: -for example, "Planning for Innovation Through Dissemination and Utilization of Knowledge", by Ronald G. Havelock et. al.*

* ISR annually published a bibliography, "List of Publications".

CIVIL ENGINEERING DEPARTMENT
Purdue University
Lafayette, Indiana

Description:

Most research conducted by the Civil Engineering Department at Purdue is concerned with analysis, and improvement in analysis techniques for studying the behavior of structures. In the past, industry has supported initial research, but lately the support has tended to be in terms of material rather than money. Federal assistance permits continuation of such research.

State-supported research in Indiana is generally in the highway area, rather than building.

Purdue has quite a lot of "non-scheduled" or "non-sponsored" research within Departments, particularly Civil Engineering. Reports are in the form of theses.

Information Generating and/or Disseminating Mechanisms:

Publishes -Student theses. Copies of doctoral dissertations are sent to Xerox University Microfilms, Ann Arbor. Some theses may be initially proprietary to the sponsoring body in the case of industry; however, a Purdue University ruling requires that all theses eventually be printed for general reading.

THE CONSTRUCTION INSTITUTE
Department of Civil Engineering
Stanford University
Stanford, California

Description:

The Stanford Construction Institute was organized in 1960 as an association between the graduate program in civil engineering-construction engineering and management and an interested group of individuals and companies. The members of the Institute provide counsel and financial support to the educational program. The University makes findings from its research readily available to the members through its publications, workshops and other contacts.

The academic program of the construction management curriculum owes much of its stature to the guidance and support of the Institute members. Their contributions help provide scholarships for outstanding students as well as funds for equipment and research expense. In addition, many members of the Institute have permitted their jobs to be used as "laboratories" and data sources for students and faculty in the pursuance of their studies and research.

Information Generating and/or Disseminating Mechanisms:

Publishes: -Technical Reports of completed research projects are mailed to Institute members, and are available from CI.

-an annual Progress Report describing the research and listing Technical Reports.

THE RAY W. HERRICK LABORATORIES
Purdue University
Lafayette, Indiana 47907
Phone: 317-749-2158

Description:

The Ray W. Herrick Laboratories is one of the major graduate research laboratories of the School of Mechanical Engineering. Most of the research activity is applicable to the area of environmental engineering. It involves problems in acoustics and noise control, climate control, fluid mechanics, heat transfer, machinery simulation and analysis, mechanical vibrations, refrigeration, stress analysis, and thermodynamics, among others. The research is primarily sponsored by industry, some by governmental agencies, and the remainder sponsored internally by Purdue University and the Herrick Laboratories. Under this program, the Herrick Laboratories offer one of the finest environments on the Purdue campus for graduate research and, in fact, compare most favorably with the best of the educational research laboratories in the country. A community of 30 or more graduate students with exceptional engineering academic records conduct their research at the Herrick Laboratories. Also, several professors of Mechanical Engineering conduct all of their research programs at the Herrick Laboratories.

Information Generating and/or Disseminating Mechanisms:

Operates: -Conferences, symposia and short courses relating to areas researched at the Laboratories.

Publishes: -Proceedings from its conferences.

-Student theses may be proprietary to the sponsoring body for a period of time; however, a Purdue University ruling requires that all these eventually be printed for general reading.*

-Proprietary Reports for Sponsors.

-Technical Articles in Professional Journals.

* Purdue University is a "Cooperating Institution" which sends copies of doctoral dissertations to Xerox University Microfilms, Ann Arbor, Michigan. (See reference to X.U.M. under Information Disseminating Centers.)

SYSTEMS BUILDING CENTER
Faculty of Applied Science and Engineering
University of Toronto
35 St. George Street
Toronto 181, Ontario
Phone: 416-928-8653, 8648
Contact: Prof. Mark W. Huggins, Chairman

Description:

SBC, a multi-disciplinary research center at the University of Toronto, is one of several industrial research institutes at Canadian universities. SBC is supported by the Department of Industry, Trade and Commerce in Canada. Begun originally to study building systems, SBC's present research effort is broadly defined to include investigation relevant to the building of and the life-time performance of constructed facilities. The aim is to obtain contract research, and work closely with industry, whether it be manufacturer, developer, or contractor. Ultimately SBC hopes to become self-supporting.

PART III: Descriptions of Selected Research Sponsoring, Conducting, and Disseminating Organizations

IIIE: Professional

American Society for Information Science
BSIC/EFL
Center for Environmental Research
Council of Planning Librarians
Educational Facilities Laboratories
Educational Resources Information Center
Engineering Index
ERIC/Clearinghouse on Educational Management
Forest Products Research Society
Research and Design Institute
Xerox University Microfilms

AMERICAN SOCIETY FOR INFORMATION SCIENCE (ASIS)
1140 Connecticut Avenue, N.W. Suite 804
Washington, D.C. 20036
Phone: 202-659-3644

Description:

ASIS is a non-profit national professional association organized for scientific, literary, and educational purposes and dedicated to the creation, organization, dissemination, and application of knowledge concerning information and its transfer. Information science is concerned with the generation, collection, organization, interpretation, storage, retrieval, dissemination, transformation, and use of information, with particular emphasis on the applications of modern technologies in these areas. As a discipline, it seeks to create and structure a body of scientific, technological, and systems knowledge related to the transfer of information. It has both pure science (theoretical) components, which inquire into the subject without regard to application, and applied science (practical) components, which develop services and products.

ASIS is dedicated to the improvement of the information-transfer process through research, development, application, and education. The Society acts as a bridge between research and development and the requirements of diverse types of information systems. ASIS provides a forum for the discussion, publication, and critical analysis of work dealing with the theory and practice of all elements involved in the communication of information.

Information Generating and/or Disseminating Mechanisms:

Operates:
- -Currently, 15 Special Interest Groups which are, in effect, small professional organizations within the Society.
- -the ERIC Clearinghouse on Library and Information Sciences. ERIC/CLIS is responsible for information pertaining to all aspects of the information-transfer process, through research, application, development, and education. Included in these concepts are such areas as the management, operation, and use of libraries and information centers, the technology used to improve their operations, and the education and training of librarians and information specialists.*

* ERIC presently has 19 different clearinghouses, and is discussed in greater detail elsewhere.

-an Annual Meeting each autumn; plus regional meetings, seminars, and workshops on specialized topics in conjunction with ASIS Chapter and other organizations.

Publishes: -"Journal of the ASIS", bi-monthly.

-"ASIS Newsletter", monthly.

-"Annual Review of Information Science and Technology": Vol. 1 (1966), Vol. 2 (1967), Vol. 3 (1968), Vol. 4 (1969), Vol. 5 (1970), Vol. 6 (1971), Vol. 7 (1972), Vol. 8 (1973).

-"Cumulative Index to the Annual Review of Information Science and Technology, Volumes 1-7".

-"ASIS Catalog of Publications, 1973".

BSIC/EFL
3000 Sand Hill Road
Menlo Park, California 94025
Phone: 415-854-2300
Contacts: John R. Boice, Editor
Joshua A. Burns, Assistant Editor

Description:

The Building Systems Information Clearinghouse was established in 1968 by a grant from the Educational Facilities Laboratories, Inc. to collect and disseminate information on educational facilities constructed with building systems, with emphasis primarily on demonstration projects or completed projects rather than on research per se.

Information Generating and/or Disseminating Mechanisms:

Operates: -A computerized data bank of completed building systems projects. A central group of conventional projects is in the process of being created.

Publishes: -BSIC/EFL Newsletter which describes demonstration and other completed educational facilities projects which have utilized systems building techniques. Published quarterly.

-BSIC Special Reports.

-BSIC Research Reports.

CENTER FOR ENVIRONMENTAL RESEARCH
955 Park Square Building
Boston, Massachusetts 02116
Phone: 617-482-9160
Contact: Kaiman Lee

Description:

CER is a not-for-profit organization. Its involvement has been in collecting, synthesizing and disseminating the most complete information on the use of computers in environmental design: feasibility study, site planning, architectural programming, relational planning, two-dimensional graphics, three-dimensional graphics, cost control, environmental control, circulation analysis, text manipulation, project control, management information system, etc.

CER has recently launched a research effort on automated procedures of writing Environmental Impact Statements (EIS).

Information Generating and/or Disseminating Mechanisms:

Operates: -a Keyword Search Service on "Bibliography" and "Computer Program Abstracts" of the computer in environmental design. Its own data base consists of more than 2000 bibliographic entries and 350 computer program abstracts.

Publishes: -"Bibliography of the Computer in Environmental Design", (BCED) Second Edition, (August) 1973, 3 volumes. It includes about 2,000 entries listed alphabetically according to authors, and a typical keyword search of more than 80 categories.
Cost: $110.00 complete, $46.00 data base only.

-"Computer/Architecture Programs", a three volume reference manual, is a collection of 124 computer program abstracts. Originally published in June 1970 ($28.00). The updated version with 350 entries is being published and will be called "Computer Programs in Environmental Design" (CPED).

-"Comprogram: Hospital Space Allocation", a reference manual of a survey of 50 Hill-Burton Hospitals.
Cost: $48.00 summary of survey.

-"The Computer in Architecture", a 16mm. color and sound movie of the ARK 2 computer system at Perry, Dean & Stewart, Architects.
Cost: $200.00.

COUNCIL OF PLANNING LIBRARIANS
Post Office Box 229
Monticello, Illinois 61856

Description:

CPL is a nationally organized group of librarians, faculty, professional planners, public and private planning organizations, and others interested in problems of library organization and research, and in the dissemination of information about city and regional planning.

Information Generating and/or Disseminating Mechanisms:

Publishes: -EXCHANGE BIBLIOGRAPHIES, each dealing with a specific area. Over 300 bibliographies are in print and are available at nominal cost from the above address. A "List of Bibliographies In Print" is also available.*

---

* See Miller, William C. Architectural Research Centers: An Annotated Directory, Exchange Bibliography #199: Monticello, Illinois: Council of Planning Librarians, July 1971; and the same, Volume 2, October 1972. Included are: (1) centers engaged in architectural research; (2) periodicals containing information concerning architectural research; and (3) directories containing architectural research center information.

EDUCATIONAL FACILITIES LABORATORIES, INC.
477 Madison Avenue
New York, New York 10022
Phone: 212-PL1-6214

Description:

EFL is a non-profit corporation established in 1958 by the Ford Foundation to help schools and colleges with their physical problems by the encouragement of research and experimentation and the dissemination of knowledge regarding educational facilities.

Information Generating and/or Disseminating Mechanisms:

Operates:

-A grant program in support of experimental and innovative approaches to the housing of education.

-A series of self-administered projects, usually resulting in publications, and often in collaboration with other non-profit organizations.

-A program of dissemination -- reports, newsletter, films, conferences, and a reference library.

-Established the Building Systems Information Clearinghouse (BSIC/EFL) for collecting and disseminating information about development projects and other systems built schools. (Described in greater detail under Disseminating Centers.)

Publishes:

-Newsletters

-Reports dealing with various aspects of educational facilities including information on funded projects.

-Supports publication of some grantee reports.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
National Institute of Education, U.S. Office of Education
U.S. Department of Health, Education, and Welfare
Washington, D.C.

Description:

ERIC is a nationwide educational information system. Its purpose is to provide ready access to current literature pertaining to every aspect of education.

ERIC consists of a coordinating staff in Washington, D.C. and a network of centers, called clearinghouses, located across the country. Each ERIC clearinghouse monitors literature concerning a specific area of educational concern. Each of the clearinghouses acquires documents and journals relating to its specified area of responsibility and processes them for announcement in ERIC's monthly reference publications.

The clearinghouses also perform research analysis functions and publish newsletters, bulletins, research reviews, and bibliographies in their particular educational areas.

Information Generating and/or Disseminating Mechanisms:

Publishes: -"Research in Education", a monthly abstract catalogue containing citations and resumes of documents processed by all the ERIC clearinghouses.

-"Current Index to Journalism Education", a monthly guide to periodical literature, reporting articles from more than 500 education or education-related journals.

ENGINEERING INDEX, INC.
345 East 47th Street
New York, New York 10017
Phone: 212-752-6800

Description:

Although not itself an engineering society, Engineering Index, Inc. has maintained close relations with engineering and scientific societies over the years. Similar to these societies, Ei is a not-for-profit, scientific, and educational corporation, incorporated in the State of New York with the same basic objective -- to collect, develop, and disseminate scientific, technical and engineering information.

For over fifty years, Ei has had a cooperative arrangement with The Engineering Societies Library (ESL) that amounts to almost a partnership. ESL provides most of Ei's input for the data base in the form of publications.

Information Generating and/or Disseminating Mechanisms:

Operates:
-"The Engineering Information Service" (EIS), an abstracting and indexing service of worldwide transdisciplinary engineering information. In addition to disseminating abstracts, entries, and indexes in printed, machine-readable, and microforms, Ei operates concurrent bibliographic services; and educational services in the form of films and seminars.

Publishes:
-"The Ei Annual", a cumulative record of the preceding year's worldwide engineering literature. It contains all the abstracts and items published in the 12 monthly issues of the preceding year of "The Engineering Index Monthly".

-"The Engineering Index Monthly", annually, covers some 3,500 publications (journals, transactions, proceedings of conferences and symposia, etc.)

-"CARD-A-LERT", which each week provides the user with a preselected group or groups of 3x5 inch index cards that contain specialized, up-to-date abstracts pertinent to his particular area of interest. These cards contain brief, one-paragraph summaries or abstracts of the latest significant developments in worldwide technical literature and conferences.

-"Publications Indexed for Engineers" (PIE), a bibliographical listing of journals and certain other serial publications abstracted and indexed selectively for each calendar year, and also published in The Engineering Index Annual of that year.

-"Subject Headings for Engineering" (SHE), the published authority list of 12,300 main headings and subheadings used for in-depth alphabetical subject indexing of Ei's data base.

ERIC/CLEARINGHOUSE ON EDUCATIONAL MANAGEMENT
University of Oregon
Eugene, Oregon 97403
Phone: 503-686-5043
Contact: Dr. Philip K. Piele, Director

Description:

ERIC/CEM is part of ERIC's nationwide network of information processing and analysis centers. Its specific task is to monitor, acquire, and process all educational literature pertaining to school management at the elementary and secondary levels and facilities at all levels of education.

By processing this literature for announcement through the ERIC system and by producing many research analysis publications, the Clearinghouse seeks to implement the exchange of information between producers and users of educational knowledge. Its research analysis products help to synthesize what is most current and topical in the literature within its scope.

In addition to classical administration subjects such as finance, law, personnel, public relations, and educational objectives, ERIC/CEM's information scope includes management and facilities concerns such as building maintenance, equipment and furnishings, and school design and construction.

Information Generating and/or Disseminating Mechanisms:

Publishes:

-"Publications" of ERIC/CEM -- reviews, bibliographies, state-of-the-knowledge monographs, and other research analysis publications.

-Newsletter, published in collaboration with the Center for Educational Policy and Management at the University of Oregon.

-"Directory of Organizations and Personnel in Educational Management", biennially.

FOREST PRODUCTS RESEARCH SOCIETY (FPRS)
2801 Marshall Court
Madison, Wisconsin 53705

Description:

An international organization existing to promote improvements in processing, marketing and use of wood in its various forms through the development, dissemination and application of technology; to foster understanding of the inter-relationship of technology with other industry functions, and to serve as a link among all concerned elements...from tree to finished product.

Information Generating and/or Disseminating Mechanisms:

Operates: -Meetings and symposia

-Abstract Information Digest Service

Publishes: -Forest Products Journal

-Wood Science

RESEARCH AND DESIGN INSTITUTE (REDE)
One Mill Street PO Box 307
Providence, Rhode Island 02901
Phone: 401-861-5390
Contact: Ronald Beckman, Executive Director

Description:

REDE is a not-for-profit, tax-exempt, multidisciplinary research agency. It is committed to investigating human behavior and to developing superior physical environments for education, health care, and general public use. REDE attempts to demonstrate that the social dislocations caused by our technological age can be offset by humanizing the spatial environments in which a person lives, learns, works, and receives medical treatment.

At REDE, a design staff translates behavioral and social research into design. One-of-a-kind, innovative demonstration environments are built for testing.

REDE has no government, industry, or university affiliations in order to maintain its independent, impartial status.

Information Generating and/or Disseminating Mechanisms:

Publishes: -Reports of research and demonstration projects and the INTERNATIONAL DIRECTORY OF BEHAVIOR AND DESIGN RESEARCH. The list is available from REDE.

XEROX UNIVERSITY MICROFILMS
300 North Zeeb Road
Ann Arbor, Michigan 48106
Phone: 313-761-4700

Description:

Xerox University Microfilms is a clearinghouse for most of the dissertations written since 1938 by doctoral candidates from over 300 institutions in North America. In 1962 a Masters Thesis Series was also begun in which over forty institutions cooperate.

Xerographic copy costs $10, microfilm $4 per thesis.

Information Generating and/or Disseminating Mechanisms:

Operates:

-DATRIX (Direct Access to Reference Information: a Xerox service), an information retrieval system which searches the Dissertation Abstracts file. Key words are derived from the titles, author's selected subject headings and other descriptive data.

Publishes:

-"Dissertation Abstracts International", divided in two definite sections, "Humanities (A)" and "Sciences (B)". A monthly compilation. Subscription rates are available from University Microfilms.

-"Masters Abstracts: A Catalog of Selected Masters Theses on Microfilm", published four times a year. Annually, a cumulative subject and author index is compiled.

APPENDIX I: Organizations visited and contacts; Conferences attended

ORGANIZATION	CONTACT(S)
CANADIAN GOVERNMENT	
B.C. Research Division of Engineering 3650 Westbrook Crescent Vancouver, British Columbia Canada 604-224-4331	J.E. Breeze, Head
Central Mortgage and Housing Corporation CMHC Building Montreal Road Ottawa, Ontario K1A OP7 Phone: 613-746-4611	Sam A. Gitterman, Senior Advisor -- Technology
Department of Industry, Trade & Commerce Tower "B" Place de Ville 112 Kent Street Ottawa, Ontario KIA OH5	John A. Dawson, Chief Construction Division, Materials Branch 613-992-0028 Dr. A. Vanterpool, Chief Technological Strategy Division Office of Science & Technology 613-992-7417
Economic Council of Canada 333 River Road P.O. Box 527 Vanier (Ottawa), Ontario KIP 5V6	B.A. Keys, Chief Productivity Section
Manitoba Research Council Norquay Building 401 York Ave. Winnipeg, Manitoba, Canada 204-946-7530	Dr, G.S. Trick, Exec. Dir.
National Research Council of Canada Division of Building Research Montreal Road Owwawa, Ontario K1A OP7 613-746-4611	Dr. Neal B. Hutcheon, Director

ORGANIZATION	CONTACT(S)
CANADIAN GOVERNMENT, continued	
National Research Council of Canada Technical Information Service (Hdqtrs) 100 Sussex Drive Ottawa, Canada 613-992-5887	G. Kirouac, Chief
NRC of Canada Technical Information Service 539 Federal Building Winnipeg, Manitoba, Canada 204-985-3947	John Kapinga
Science Council of Canada Kent-Albert Building 150 Kent Street Ottawa, Ontario KIP 5P4 613-996-1445	Arthur H. Wilson, Science Advisor

ORGANIZATION	CONTACT(S)
GOVERNMENT	
State of Florida Department of Education Tallahassee, Florida 32304	Wayne Betts, State Architect
State of Florida Department of Education Schoolhouse Systems Project Tallahassee, Florida 32304	Jim Bruce Dr. Harold Cramer
State of Florida Dept. of General Services Larson Building Tallahassee, Florida 32304 904-488-2774	Robert H. Brown, Jr. William Luger Harry Dickman
United Nations Centre for Housing, Building, and Planning New York, New York	Alberto Gonzalez-Gandolfi Chief Building Section

ORGANIZATION	CONTACT(S)
UNITED STATES GOVERNMENT	
Highway Research Board 2101 Constitution Ave. N.W. Washington, D.C. 20418 202-393-8100	Dr. Paul Irick
National Science Foundation 1800 G St. N.W. Washington, D.C. 20550	Office of Experimental R&D Incentives C. Branson Smith 202-632-5904 Dr. Arthur Ezra Research Applied to National Needs Harold Horowitz 202-632-7364 Tom pretorius Science Information Service Jack Stearns 202-632-5826
Small Businesses Administration Technology Utilization Division Room 608 1441 L Street N.W. Washington, D.C. 20416 202-382-6333	Forrest Decker John W. Robinson
Small Businesses Administration Technical Utilization Division 450 Golden Gate Ave. San Francisco, Calif. 94102 415-556-5969	Peter Saugman
Smithsonian Science Information Exchange 1730 M Street N.W. Suite 300 Washington, D.C. 20036 202-381-5703 or 5709	Dick Reeser Sam Liebman
U.S. Department of Agriculture Forestry Service Extension Program Colorado State University Fort Collins, Colorado 303-491-6281	Lowell Watts, Director

ORGANIZATION	CONTACT(S)
UNITED STATES GOVERNMENT, continued	
U.S.D.A. Forest Service N.W. Forest & Range Experiment Station Wood Construction Research 4507 University Way, N.E. Seattle, Washington 206-442-7845	Jack Grantham
U.S.D.A. Forest Service Pacific S.W. Forest & Range Experiment Station 1960 Addison St. Berkeley, California 415-841-5121 x235	John K. McDonald, Chief; George Harpole
U.S. Department of Commerce National Bureau of Standards Institute for Applied Technology Center for Building Technology Washington, D.C. 20234 301-921-1000	Sam Kramer Jim Haecker Harry Thompson Morris Nimno
U.S. Department of Commerce National Bureau of Standards Office of Building Standards and Code Services Washington, D.C. 20234 301-921-1000	Charles P. Mahaffey Harry Shoub
U.S. Department of Commerce National Technical Information Service Springfield, Va. 22151 703-321-8888	George Kudravetz Mrs. Vietta Dowd
U.S. Dept. of Housing & Urban Development 451 7th Street S.W. Washington, D.C.	Jack Scalzi, Div. of Bldg. Tech. Office of Res. & Tech. Rm. 4116 202-755-5356 Andres Euston, Urban Design Systems Officer, Rm. 7126 202-755-5983

ORGANIZATION	CONTACT(S)
UNITED STATES GOVERNMENT, continued	
Department of the Navy Naval Civil Engineering Laboratory Field Engineering Support Office Port Hueneme, California 805-982-4070	Eugene Early
Department of the Navy Naval Facilities Engineering Command (NAVFAC) Room 2B4 Washington, D.C. 202-697-6020	Milon E. Essoglou
Department of the Navy Naval Material Command 732 N. Washington St. Rm. 403 Alexandria, Va. 22314 202-697-1300	Francis Nelson
Department of the Navy Naval Ordinance Lab Code 124 White Oak Silver Springs, Md. 20910 301-495-7624	Dr. Sherman Gee
Department of the Navy Office of the Assistant Secretary to the Navy (Research & Development) Pentagon Building 4E 741 Washington, D.C. 20350 202-697-5060	Dr. Sam Koslov, Special Assistant for Research
U.S. Library of Congress National Referral Center for Science and Technology 1st between E. Capital & Independence Avenue S.E. Washington, D.C. 202-426-5000	James Trew

ORGANIZATION	CONTACT(S)
QUASI-GOVERNMENT	
Building Research Advisory Board Building Research Institute 2100 Pennsylvania Ave. N.W. Washington, D.C. 202-961-1515	Bob Dillon Stu Charlesworth
Knowledge Availability Systems Center (KASC) NASA Research Dissemination Centre University of Pittsburgh 135 N. Bellefield Pittsburgh, Penn. 15213 412-621-6877	Mrs. Elizabeth Hartner, Mgr. of Technology Analysis
Urban Development Corporation 1345 Avenue of the Americas New York, New York 10019 212-974-7064	David M. Pellish
Western Research Application Center (NASA Research Application Center) University of So. Calif. 809 W. 34th St. Los Angeles, Calif. 213-746-6132	A. Kendall Oulie, Director Herb Asbury, Head Tech. Operator

ORGANIZATION	CONTACT(S)
UNIVERSITY	
University of California at Berkeley Department of Architecture Berkeley, California 415-642-6000	Professors: Richard Bender, Jean-Pierre Protzen, Vladimir Brazanak, William Russell Ellis Dick Meier
University of California at Berkeley Psychology Department Berkeley, California 415-642-7139	Prof. Kenneth Craik
University of California at Davis Psychology Department Davis, California	Prof. Robert Summer
University of California at Los Angeles Room 3315, 405 Hilgard Westwood, Los Angeles 213-825-7370	Prof. Murray Milne
Colorado State University Civil Engineering Department Rm. 16 Fort Collins, Colorado 307-491-6697	Prof. James R. Goodman
University of Kentucky Department of Architecture Lexington, Kentucky	Prof. Richard Levine
University of Manitoba Center for Settlement Studies Winnipeg, Manitoba, Canada 204-474-9820	Professors: L.B. Siemans, Al Lansdown, Carl Nelson
Massachusetts Institute of Technology A.P. Sloan School of Management Cambridge, Mass. 02139 617-253-1000	Prof. Thomas J. Allen

ORGANIZATION	CONTACT(S)
UNIVERSITY, continued	
University of Michigan Architectural Research Lab. Ann Arbor, Mich. 48104 313-764-1817	Professors: Harold Borkin, Gerald Rolfsen, Steven Paraskevopoulos
University of Michigan Center for Research on Utilization of Scientific Knowledge Institute for Social Research Ann Arbor, Michigan 313-764-2560	Dr. David Lingwood
University of Missouri Home Economics Department Columbia, Missouri	Mrs. Judy Heffernan Dr. Kate Rogers
University of Missouri Department of Civil Engineering Columbia, Missouri	Dr. Ken Beuchart
University of Montreal Faculte de l'Amenagement Montreal, Quebec 514-343-7420	Prof. Colin H. Davidson
Naval Postgraduate School Department of Civil Engineering Monterey, California 93940	Prof. James Jolly Dr. J.W. Creighton
Purdue University Lafayette, Indiana	Professors: George Leonards (C.E.), Vernon Meyers, (C.E.), Geo. Palmer (Aerodynamics), Victor W. Goldschmidt (Ray Herrick Labs, M.E.), Clifford C. Petersen (Center for Large Scale Systems, E.E., I.E.)
University of So. California Department of Architecture Los Angeles, Calif.	Assoc. Dean Gerald Weisbach Prof. Ralph Knowles

ORGANIZATION	CONTACT(S)
UNIVERSITY, continued	
University of So. California Gerontology Center Los Angeles, California	Prof. Eric Pawley
Stanford University Construction Institute Department of Civil Engineering Palo Alto, California	Prof. John Fondahl
Temple University Department of Sociology Philadelphia, Penna. 19122 215-787-7000	Dr. Rosalie Cohen
University of Toronto Systems Building Center Faculty of Applied Science & Engineering Galbraith Building 35 St. George Street Toronto 181, Ontario 416-928-8653	Prof. Mark W. Huggins
University of Utah Department of Architecture Salt Lake City, Utah 801-581-8254	Dr. Kurt Brandle Prof. Roger Bailey Dean Bob Bliss
University of Utah Psychology Department Salt Lake City, Utah 801-581-6877	Prof. Calvin Taylor grad students: Ron Peterson, Horace Williamson, Bill Rodell, Bruce Meyer, Wayne Veneklasens
Washington University Department of Architecture St. Louis, Missouri	Assoc. Dean Michaelides Professors: Tom Thomson, Franz Albert, Jim Fitzgibbons

ORGANIZATION	CONTACT(S)
UNIVERSITY, continued	
Univeristy of Washington College of Architecture & Urban Planning Seattle, Washington 206-543-4180	Professors Robert Dietz, Arnold Rosner

ORGANIZATION	CONTACT(S)
INDUSTRY	
Alcoa Building Industry Room 2824 Alcoa Building Pittsburgh, Penn. 412-553-2697 (Barton)	Otis M. Mader, Frank I. Hinchcliffe, Charles F. Pridmore, J. Robert Stemle, Robert H. Barton, T.R. Gauthier, R.L. LaBarge
The Boeing Company The Urban Services Group P.O. Box 3999 Seattle, Washington 98214 206-773-1580	E.K. Muller, Aerospace Group
Dow Chemical Company Div. of Construction Materials, Technical services & Development Midland, Michigan 48640 517-636-4601	Tom E. Werkema Jon Laing
Grumman Allied Industries 600 Old Country Road Garden City. L.I. New York 516-741-3500	Robert Ferran
Johns-Manville Products Corp. Research & Development Center Greenwood Plaza Denver, Colorado 303-770-1000	J.H. Zettel H.O. McElyea
Owens-Corning Fiberglas Corp. Fiberglas Tower Toledo, Ohio 43659 419-259-3628	Dan Morgenroth
RCA Limited Research Laboratories Government and Commercial Systems Division Ste-Anne-de-Bellevue, Quebec 514-453-9000	Dr. Robert G. Harrison
U.S. Gypsum Research Center 1000 East NW Highway Des Plaines, Illinois 60016 312-299-3381 x209	James Walker

ORGANIZATION	CONTACT(S)
INDUSTRY, continued	
U.S. Steel Corporation Applied Research Laboratory 125 Jamison Lane Monroeville, Penna. 15146 412-351-3100	Dan Crise Gerald Roeder Larry Seigel
Urban Systems Development Corp. (Westinghouse) 1911 Jefferson Davis Highway Arlington, Virginia 703-521-2000	Rex Garrett
Westinghouse Electric Corp. Research & Development Center Beulah Road, Churchill Borough Pittsburgh, Penna. 15235 412-256-7000	Hilary Szymanowski Don Walukas
The Weyerhaeuser Company 3400 13th Ave. S.W. Seattle, Washington 98134	Jon B. Dunnington

ORGANIZATION	CONTACT(S)
PROFESSIONAL	
Abt Associates 55 Wheeler St. Cambridge, Mass. 617-492-7100	David MacFadyen
American Institute of Architects 1785 Massachusetts Ave. Washington, D.C. NW 202-265-3113	Don Conway
BSIC/EFL 3000 Sandhill Road Menlo Park, Calif. 94025 415-854-2300	John Boice Josh Burns
Batelle Memorial Institute 505 King Ave. Columbus, Ohio 43201 614-299-3151	Roland Guy
Charles Luckman Associates 521 5th Avenue New York, NY 212-986-6161	Bob Knapp
Deasy & Bolling 3121 Temple St. Los Angeles, Calif. 213-381-7851	Cornelius Deasy
ERIC Clearinghouse on Educational Management University of Oregon Eugene, Oregon 503-686-5043	Dr. Philip Piele
Educational Facilities Laboratories, Inc. 477 Madison Avenue New York, N.Y. 10022 212-751-6214	Alan C. Green

ORGANIZATION	CONTACT(S)
PROFESSIONAL, continued	
Engineering Index 345 East 47th Street New York, N.Y. 212-752-6800	Charles S. Lang
Mr. G. Kerby Garden Building Science Consultant 1740 Cayuga Drive NW Calgary, Alberta, Canada 403-282-7591	G. Kerby Garden
Helmer & Tutton, Architects and Site Planners 287 Maclaren Ottawa, Canada 613-236-9118	D'Arcy G. Helmer
Mellon Institute Carnegie-Mellon University 4400 Fifth Avenue Pittsburgh, Pa. 15213 412-621-1100	Dr. A.G. Webb Tom Fox Dr. McGovern Dr. John Green
Research & Design Institute 25 Holden St. Providence, Rhode Island 401-861-5390	Ronald Beckman
Scanda Consultants Ltd. 112 Lisgar Ottawa, Canada 613-236-7179	Robert E. Plates
Shelley Systems 400 Parks Avenue New York, New York 212-486-9424	Jordan Gary Mertz
Skidmore Owings & Merrill 30 West Monroe Chicago, Illinois 60603 312-340-6161	Tony Griffin

ORGANIZATION	CONTACT(S)
PROFESSIONAL, continued	
University Microfilm A Xerox Company 300 North Zeeb Road Ann Arbor, Michigan 48106 313-	Ms. Pat Colling
Warner Consultants 75-A G Street SW Washington, D.C. 20024 202-737-0255	Jack Warner

CONFERENCES	PLACES/DATES
INBEX: Industrialized Building Exposition to Congress	Louisville, Kentucky Oct. 30 - Nov. 2, 1972
AR/9: 9th Annual Research Conference of the American Institute of Architects An Inquiry into Research Needs and Opportunities for Architects	Chicago, Illinios Nov. 17-18, 1972
U.S. Department of Agriculture Forest Service National Research Implementation Workshop	Atlanta, Georgia Jan. 15 - 19, 1973
Highway Research Board Annual Meeting	Washington, D.C. Jan. 23, 1973
EDRA4: Environmental Design Research	Blacksburg, Va. April 15-18, 1973

APPENDIX II: Additional organizations in original sample who were not visited, with reasons for including them in the study

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
GOVERNMENT	
Centre Recherche Industrielle Quebec (CRIQ) 1006 rue de l'Eglise Quebec City, Quebec /Michel Normandin, Director	One of Canada's newest research centers, it is decentralized into three branches within Quebec Province. Recommended by Neal Hutcheon and A. Wilson.
U.S. Department of Agriculture Forest Service Cooperative Extension Service of Clemson University Clemson, S.C. 29631 /F.H. Hedden 803-656-3160	Extension Service Pilot House Program: The Forest Service has contracted research at Clemson to improve housing through providing information to buyers, builders & communities; specifically to aid builders and owners to understand local situations and problems. In its third year now, the aim is to develop a national program, which will also foster university-based research in building.
U.S. Department of Agriculture Forest Products Laboratory P.O. Box 5130 Madison, Wisconsin 53705 /Jerome F. Saeman	Recommended by many in and outside the Forest Service as a source of research information in wood products -- both positive and negative criticism.
U.S. Department of the Army Civil Engineering Research Laboratory (CERL) Systems Building Branch P.O. Box 4005 Champaign, Illinois 61820 /Samuel T. Lanford	The Army's equivalent of the Naval Civil Engineering Lab at Port Hueneme. The Systems Building Branch has "the prospect of continued research in behavioral, environmental/ecological, planning and Industrialized Building Systems, all related, staffed with a combination of architects and related professionals. Our IBS team is finalizing an INTERIM GUIDE to IBS for use of CORPS District Engineers and other responsible officers in military construction which will likely be printed by fall."*

---

* From a letter received 30 April, 1971 from Mr. Lanford.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
GOVERNMENT, continued	
U.S. Department of Health, Education and Welfare, National Institute of Mental Health Washington, D.C.	Federal agency sponsoring research in health and education fields. Published a directory of research relating to building.
National Aeronautics and Space Administration Technology Utilization Office Washington, D.C. 20546 /Jeffrey T. Hamilton 202-755-3777	Federal research sponsoring and contracting agency whose data base is important. Interested in technology transfer to the civilian sector.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
UNIVERSITIES	
University of Arizona College of Architecture Tuscon, Arizona 85721 /R.E. McConnell 602-884-3134	Recommended for research into user needs for living facilities.
Carleton University Department of Architecture Ottawa, Canada /Douglas Shadbolt 613-231-6380	Building research in the Department of Architecture. Also have a program for involving students in architectural practice.
Cornell University Center for Urban Development Research 726 University Avenue Ithaca, New York 14850 /Franklin S. Bergen 607-256-6262	Center for Urban Development Research has been suggested as a source of information for the URRBI study.
University of Florida Department of Architecture Gainsville, Florida /William G. Wagner	The Bureau of Research in the Dept. of Architecture is the State of Florida's funded research program for building. Several people interviewed during this study (Boice, BSIC/EFL; Bob Dillon, BRAB/BRI; Cramer, SSP, Fla.; Dietz, MIT) have recommended talking with Wagner and Halpern in conjunction with URRBI.
University of Illinois Champaign, Illinois /H. Choldin, Fred Moyer	Research in sociology, city planning and architecture is relevant to building. Considered a vital institution in this respect, and recommended for URRBI.
Universite Laval Department of Architecture Quebec City, Quebec, Canada /Professors Roger Richard, Doug Wren 418-656-2131	Research is conducted in building systems for Canada. Funds come from government and industry. Prof. Wren was in industry for several years before teaching.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
UNIVERSITIES, continued	
Lehigh University Center for Information Sciences Bethlehem, Pennsylvania /Don Hillman	Has a grant from NSF Science Information Service to set up a computerized system by words, which will include Engineering Index Abstracts.
Louisiana State University Department of Architecture Baton, Rouge, Louisiana /William G. McMinn	Research is conducted in the Department of Architecture which is relevant to URRBI. Recommended by the CE, Soc. and Home Ec. Departments of University of Missouri, Columbia.
University of New Mexico Department of Architecture 2414 Central Street S.E. Albuquerque, New Mexico 87106 505-277-2903	Recommended by several as a research oriented institution relevant to URRBI.
State University of New York at Buffalo School of Architecture and Environmental Design 2917 Main Street Buffalo, New York 14214 /Gunter Schmitz	To see how student-based research into process and product for industrialization of building is implemented.
North Carolina State University Department of Architecture Raleigh, North Carolina 27607 /Henry Sanoff 919-755-2204	Widely recommended in conjunction with the URRBI study because of research being conducted in architecture and related areas.
Nova Scotia Technical College School of Architecture P.O. Box 1000 Halifax, Nova Scotia	Funded by Sir George Williams University of Montreal to do a state-of-the-art study of building research, possibly similar to URRBI.
University of Oklahoma Bureau of Water and Environmental Resources Research 202 West Boyd Street Rm. 301 Norman, Oklahoma 73069 /George W. Reid	Experimenting with a model to study Tulsa in the framework of large-scale systems analysis.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
UNIVERSITIES, continued	
University of Pennsylvania Architectural Research Unit 3401 Market Street Philadelphia, Pennsylvania 19104 /Sheila Clibbon	Architectural Research Unit is involved in health care facilities planning, for example.
Pratt Institute 215 Ryerson Brooklyn, New York /George Konz 212-622-2200	"A research data bank is in the process of being set up which hopefully will coordinate with other schools." (See Page 5, item 2 in Jan. '73 ASCA newsletter).
Rensselaer Polytechnic Institute Troy, New York 12181 /David S. Haviland, Walter Kroner 518-270-6460	The Architectural Dept. has conducted considerable research. Haviland has been recommended as a source of information for the URRBI study. Kroner sent me reports on some of their activities. (Also see Page 5, item 5 of Jan. '73 ASCA newsletter).
Rice Institute Center for Community Design & Research Houston, Texas /David Crane, Bill Caudill 713-528-4141	The Center for Community Design & Research is just becoming operational. Established by Crane to provide real-world projects for student involvement. In his various capacities, Caudill has done considerable research and investigation in building here and abroad.
Texas A & M University Architectural Research Center College of Architecture and Environmental Design College Station, Texas 77843 /F.J. Trost, D. Sweeney	The Architecture Research Center has evidently conducted research relevant to the URRBI study. Recommended by several people interviewed thus far.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
UNIVERSITIES, continued	
University of Texas The Center for Building Research College of Engineering Austin, Texas	The Center for Building Research conducts multi-disciplinary investigations for the built environment.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY*
INDUSTRY	
Gulf Reston, Inc. Reston, Virginia 22070 /James W. Todd, V.P. 703-471-4810	A subsidiary of Gulf Oil Co., this organization is concerned with implementation of new technologies with respect to real estate development.
Radmo, Inc. 2645 St. Lucie Avenue Vero Beach, Florida /Robert Blake 305-562-2003	Plastics manufacturer producing a fiberglas structure; done their own R&D.
Recreational Systems P.O. Box 1242 Garrissville, Florida 32601 /Perry Mullenax, V.P.; Gen. Mgr. 904-376-2652	Using plastic panels supplied by by Panelcomb Industries, also located in Gainsville.

---

* UNVERIFIED, as there was no time or funds to interview

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
PRIVATE/PROFESSIONAL	
American Iron & Steel Institute 1000 16th Street N.W. Washington, D.C. 20036	A trade association which funds research towards better material specifications.
Arthur D. Little Housing & Urban Development Acorn Park Cambridge, Massachusetts /Alan Balfour 617-864-5770	ADL reportedly conducts contracted research for industry and government.
Auerbach Corporation 121 North Broad Street Philadelphia, Pennsylvania /Herb Landau 215-491-8229	Developed a pilot construction materials availability retrieval system for the Canadian Department of Industry, Trade & Commerce -- specifically for the BEAM Program headed by John Dawson in Ottawa.
Brick Institute of America 1750 Old Meadow Road McLean, Virginia 22301	A trade association which funds research towards better material specifications.
Buffalo Organization for Social & Technological Innovation, Inc. 812 Kenmore Avenue Buffalo, New York 14216 /Michael Brill 716-874-4577	Does contracted research involving State University of New York at Buffalo students.
Construction Specifications Institute 1150 170 Street N.W. Washington, D.C. 20036 202-833-2160	A trade association which funds research towards better specifications in construction.
Environmental Systems International, Inc. 3030 South Bundy Drive Los Angeles, California 90066 /Barry Berkus, Mack L. McCoy 213-391-0321	Beyond involvement with Levitt for an Operation Breakthrough proposal, and with Levitt with their Mobile Systems, ESI is a firm particularly concerned with research in building.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
PRIVATE/PROFESSIONAL, continued	
Ewing Cole Erdman & Eubanks, Architects 400 Market Street Philadelphia, Pennsylvania /Donald Phimister 215-WA3-0321	Conducted research in systems building for State government.
NAHB Research Foundation 627 Southtown Lane Rockville, Maryland 20850	A trade association which funds research towards better specifications for house building.
National Concrete Masonry Association 1800 North Kent Street Arlington, Virginia 22209 703-524-0815	A trade association which funds research towards better material specifications.
National Federation of Abstracting and Indexing Services 3401 Market Street Philadelphia, Pennsylvania 19104 215-349-8572	Central source of information concerning abstracting and indexing reports and publications.
National Forest Products Association Washington, D.C. 202-332-1050	A trade association which funds research towards better material specifications.
Organization for Social and Technological Innovation Cambridge, Massachusetts /Donald Schon	Parent of BOSTI
Portland Cement Association Old Orchard Road Skokie, Illinois 60076 /Ashby T. Gibbons, Jr. 312-583-6200	A trade association which funds research towards better material specifications.
Reedy Creek Improvement District P.O. Box 36 Lake Buena Vista, Florida 32830 /Tom Moses 305-828-2034	This is the organization which is developing WDW & EPCOT (See July 1972 Arch. Forum), and Moses is the impetus behind its development and continuum. Important to the study as they have utilized research results from industry, written their own codes, and are truly innovators of process and product.

ORGANIZATION/CONTACT	REASON FOR INCLUDING IN STUDY
PRIVATE/PROFESSIONAL, continued	
Society of the Plastics Industry, Inc. 250 Park Avenue New York, New York 10017 /Ralph L. Harding, Jr. 212-687-2675	A trade association which funds research towards better material specifications. Since plastics has been termed the "orphan of the building industry", and has potential as the "building material of tomorrow", this source should be investigated.
Underwriters' Laboratory, Inc. 333 Pfingsten Road Northbrook, Illinois 60062 /E.N. Davis 312-273-4255	UL's approval is one step towards a product's acceptance in the building industry. The research, development, testing and evaluation procedures are worth investigating.

REFERENCES

Canada. Department of Industry, Trade and Commerce. Thesaurus of Canadian Construction Terminology, BEAM Program. Preliminary Edition. Ottawa: February 1971.

Creighton, J.W., J.A. Jolly, S.A. Denning. Enhancement of Research and Development Output Utilization Efficiencies; Linker Concept Methodology in the Technology Transfer Process. Monterey: Naval Postgraduate School, June 1972.

Cummings, John, and Duncan Wilson, ed. Synopsis and Proceedings of the First International Systems Building Round Table Conference, November 17-19, 1971. Boston: Boston Architectural Center, January 1973.

Miller, William C. Architectural Research Centers: An Annotated Directory, Exchange Bibliography #199. Monticello, Illinois: Council of Planning Librarians, July 1971.

_____. Architectural Research Centers: An Annotated Directory --Volume 2, Exchange Bibliography #333. Monticello, Illinois: Council of Planning Librarians, October 1972.

U.S. Office of the Federal Register. United States Government Organization Manual. Washington, D.C.: U.S.G.P.O., n.d.

Watts, L.H., ed. coord. A People and a Spirit, a Report of the Joint USDA-NASULGC Extension Study Committee. Fort Collins: Colorado State University, Printing and Publications Service, November 1968.

Wilson, Andrew H. Research Councils in the Provinces: a Canadian Resource, Background Study for the Science Council of Canada, Special Study No. 19. Ottawa: June 1971.

BIBLIOGRAPHY

Archea, John et. al. Socio-Physical Technology: A State-of-the-Art Report. Philadelphia: Center for Urban Research and Experiment, University of Pennsylvania, May 31, 1971.

ASCE Committee on Research. Goals of Civil Engineering Research: Its Responsiveness to the Needs, Desires and Aspirations of Man. Terre Haute, Indiana: Rose-Hulman Institute of Technology, September 1971.

Canada, Science Council of. Innovation in a Cold Climate: The Dilemma of Canadian Manufacturing, Report No. 15. Ottawa: October 1971.

Center for Urban Development Research. List of Publications. Ithaca, New York: Cornell University, March 1973.

Civil Engineering Department. Papers and Reports on Housing, (an unpublished list, University of Missouri, Columbia, 1972).

Colorado State University and The American Society of Civil Engineers. Research Needs Relevant to the Goals of Society. Fort Collins: Colorado State University, June 1971.

Cooper, Gary, ed. International Symposium on Criminal Justice Information and Statistics Systems, October 3-5, 1972. New Orleans: Project Search and the Law Enforcement Assistance Administration.

COSATI Federal Council for Science and Technology. Directory of Federally Supported Information Analysis Centers. Springfield, Virginia: National Technical Information Service. January 1972.

Erickson, Bruce, Gunter Schmitz and Tom Thomson. Report of the ACSA ad hoc Committee on Research, an unpublished report, n.d.

Guy, R.B., et al. The State of the Art of Prefabrication in the Construction Industry, a Final (Research) Report to the Building and Construction Trades Department AFL-CIO. Columbus, Ohio: Battelle Memorial Institute, September 29, 1967.

Hassid, Sami. Doctoral Studies in Architecture. Berkeley: College of Environmental Design, University of California, April 1971.

Havelock, Ronald G. Planning for Innovation Through Dissemination and Utilization of Knowledge. Ann Arbor: Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, January 1971.

_____. Research Utilization in Four Federal Agencies, (paper prepared for symposium: The Utilization of Research in Planning for Community Services: Current Patterns and Alternative Approaches. American Psychological Association Annual Convention, Honolulu, Hawaii, Sept. 7, 1972). Ann Arbor: Institute for Social Research, University of Michigan.

Hutcheon, N.B. "Approval of Building Materials -- Part I: Features of a System of Regulation; Part II: Standards and Their Application in Building", reprints. Ottawa: Division of Building Research, National Research Council of Canada, May 1972.

_____. Codes, Standards and Building Research. Ottawa: Division of Building Research, National Research Council of Canada, November 1971.

Industrialization Forum. I.F. Thesaurus of Building Sciences and Technology. Preliminary Edition. Montreal: 1972.

IF Team, The, et. al. C.I.B. Guidelines for the Elaboration and Development of Thesauri. Montreal: Faculte de l"Amenagement, Universite de Montreal, 1973.

Lee, Kaiman, ed. Bibliography of the Computer in Environmental Design. Boston: Center for Environmental Research, August 1972.

Lingwood, David A. A Research Cube for Environmental Social Science: I. Introduction and Survey Research, a monograph. Ann Arbor: Center for Research on Utilization of Scientific Knowledge, Institute for Social Research, University of Michigan, May 13, 1971.

Masterson, Charles and Michael Brill. Some Thoughts on the Direction of User Requirements Research, AIA Research Paper No. 0074, prepared for the AR/9 Conference, October 1972.

Murray, Donald. "A Reference Guide to Information Services", Industrialization Forum, Vol. 3, No. 5, June 1972, pp 19-22.

National Aeronautics and Space Administration. Scientific and Technical Aerospace Reports. Vol. 11, No. 6. Washington, D.C.: March 23, 1973.

Neugroschl, Seth. "Bringing Change to El Barrio", Innovation, 1969, No. 4, pp 12-17.

Palmer, George M. Resume of Building Aerodynamics Wind Tunnel Studies and Talks, (an unpublished list, Lafayette, Indiana, 1971).

Petersen, Ronald W. The Whole Earth Guide to Where It's At: Or, Where to go for What's Happening in Architectural Psychology, (an unpublished bibliography, Department of Psychology, University of Utah, Salt Lake. March 12, 1973.

Pfrang, Edward O. and Felix Y. Yokel. Structural Performance Evaluation of a Buildling System, Building Science Series 25. Washington, D.C.: National Bureau of Standards, November 1969.

Research and Design Institute. 1969 Directory of Behavior and Environmental Design. Providence, R.I.: 1969.

Rickert, John E. Urban Thesaurus: A Vocabulary for Indexing and Retrieving Urban Literature. Kent, Ohio: Center for Urban Regionalism, Kent State University, 1968.

Rivkin/Carson, Inc. RE$EARCH: A Study of Architectural Research Assistance Opportunities from the Federal Government. Washington, D.C.: March 1972.

Rolfsen, Norman G. The Breakthrough in Housing: an Evaluation of Proposed Innovations and Their Development Potential, (an unpublished doctoral dissertation for the department of Environmental Sciences, University of Michigan, 1972). Ann Arbor: University Microfilms.

Rowland, Gene A. and Neil E. Gallagher. Performance Standards -- Their Compatibility with the Building Regulation System. Washington, D.C.: Center for Building Technology, National Bureau of Standards, n.d.

Schiffman, Robert L. Report on the Special Workshop on Engineering Software Coordination, Report No. 72-2. Boulder, Colorado: Computing Center, University of Colorado, March 1972.

Stewart, C.D., Teicholz, E., Lee, K. Computer Architecture Programs, 3 volumes. Boston: Center for Environmental Research, 1970.

_____. Unique 3-in-1 Research & Development Directory. Washington, D.C.: Government Data Publications, 1972.

United Nations' Department of Economic and Social Affairs. Design of Low-Cost Housing and Community Facilities, Volume I: Climate and House Design. New York, 1971.

_____. Modular Coordination of Low-Cost Housing. New York, 1970.

_____. The Use of Bamboo and Reeds in Building Construction. New York, 1972.

_____. Use of Precast Components in Masonry Building Construction. New York, 1972.

U.S. Army Logistics Management Center. The Nation's R&D Effort. Springfield, Virginia: National Technical Information Center, December 1969.

U.S. Department of Commerce. Keywords for the Center for Building Technology's Document Referral System. Washington, D.C.: National Bureau of Standards, October 1972.

U.S. Library of Congress, Science and Technology Division, National Referral Center. Physical Sciences Engineering: a Directory of Information Resources in the United States. Washington, D.C.: U.S.G.P.O., 1971.

U.S. Office of Naval Research. Thesaurus of Engineering and Scientific Terms. Washington, D.C.: U.S. Department of Defense, 1967.

Ventre, Francis T. Social Control of Technological Innovation: the Regulation of Building Construction, (an unpublished doctoral dissertation for the Department of Urban Studies and Planning, Massachusetts Institute of Technology, Cambridge, Massachusetts, June 1973).

Warner Consultants. The Market Potential for Electrical Contractors in Systems Building, a National Electrical Contractors Association study. Washington, D.C.: Warner Consultants, n.d.

Wilson, Andrew H. Governments and Innovations, Special Study No. 26. Ottawa: Science Council of Canada, April 1973.

Boston Architectural College
Library

Boston Architectural College
Library

4835 12

BAC LIBRARY
52430

Utilization of research results
in the building industry :
a state of the art survey
Closed Stacks
TH153 .W55 1974